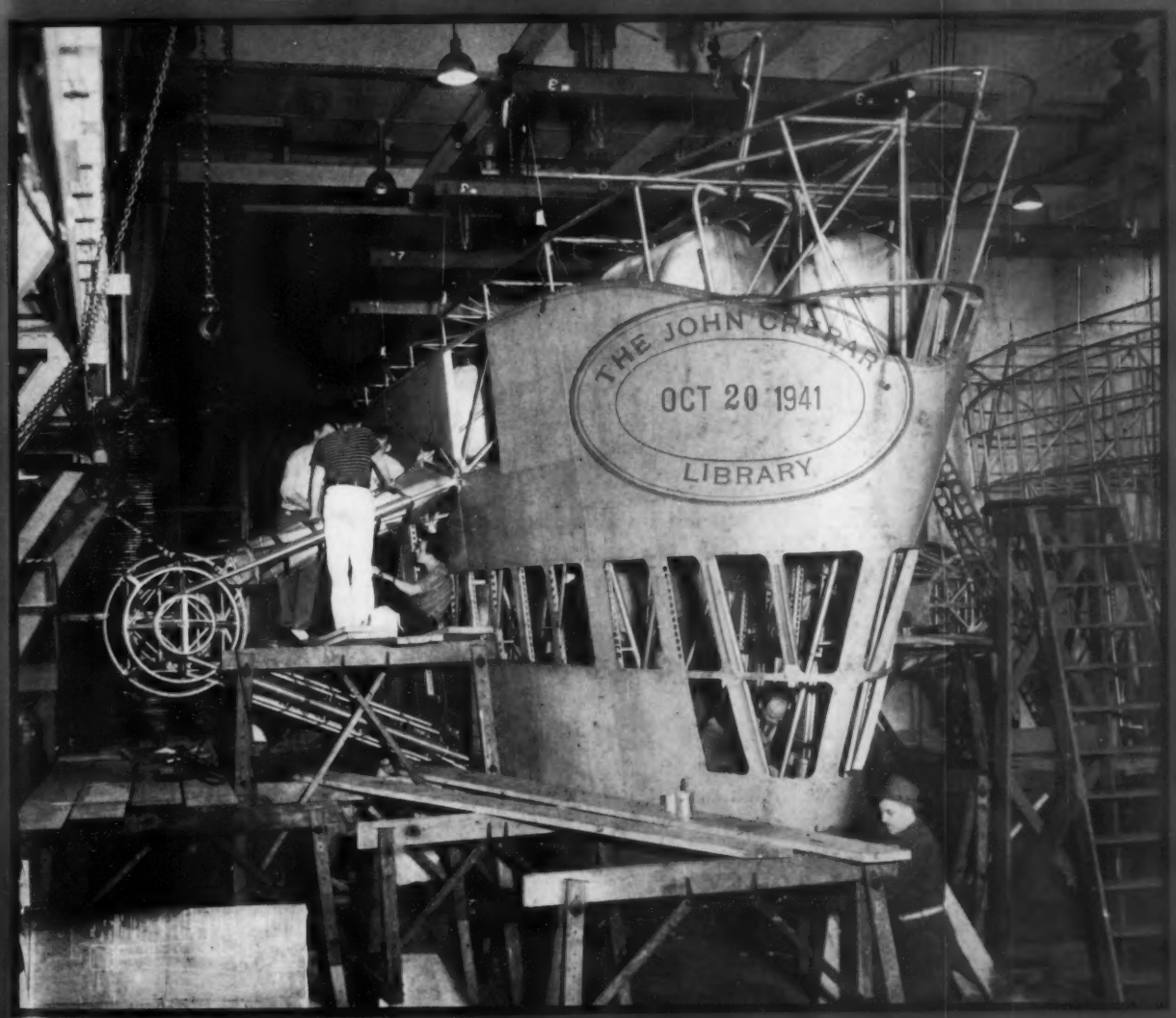
JOURNAL OF THE AERONAUTICAL SCIENCES

AERONAUTICAL REVIEW SECTION



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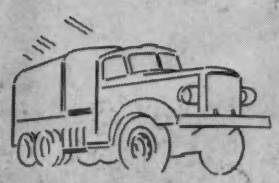

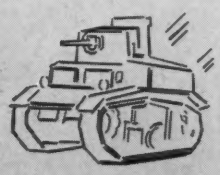

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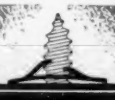

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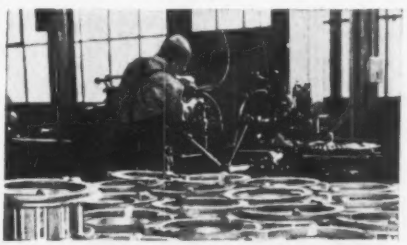

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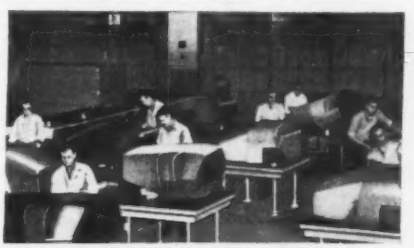

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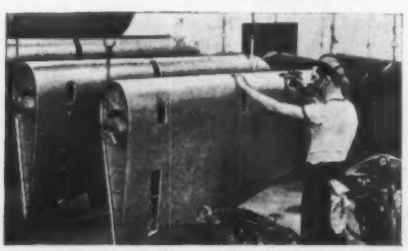

TAILS—*finishing tail assemblies, Goodyear-built for Martin B-26 bombers.*

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AERONAUTICAL REVIEW SECTION

OCTOBER, 1941

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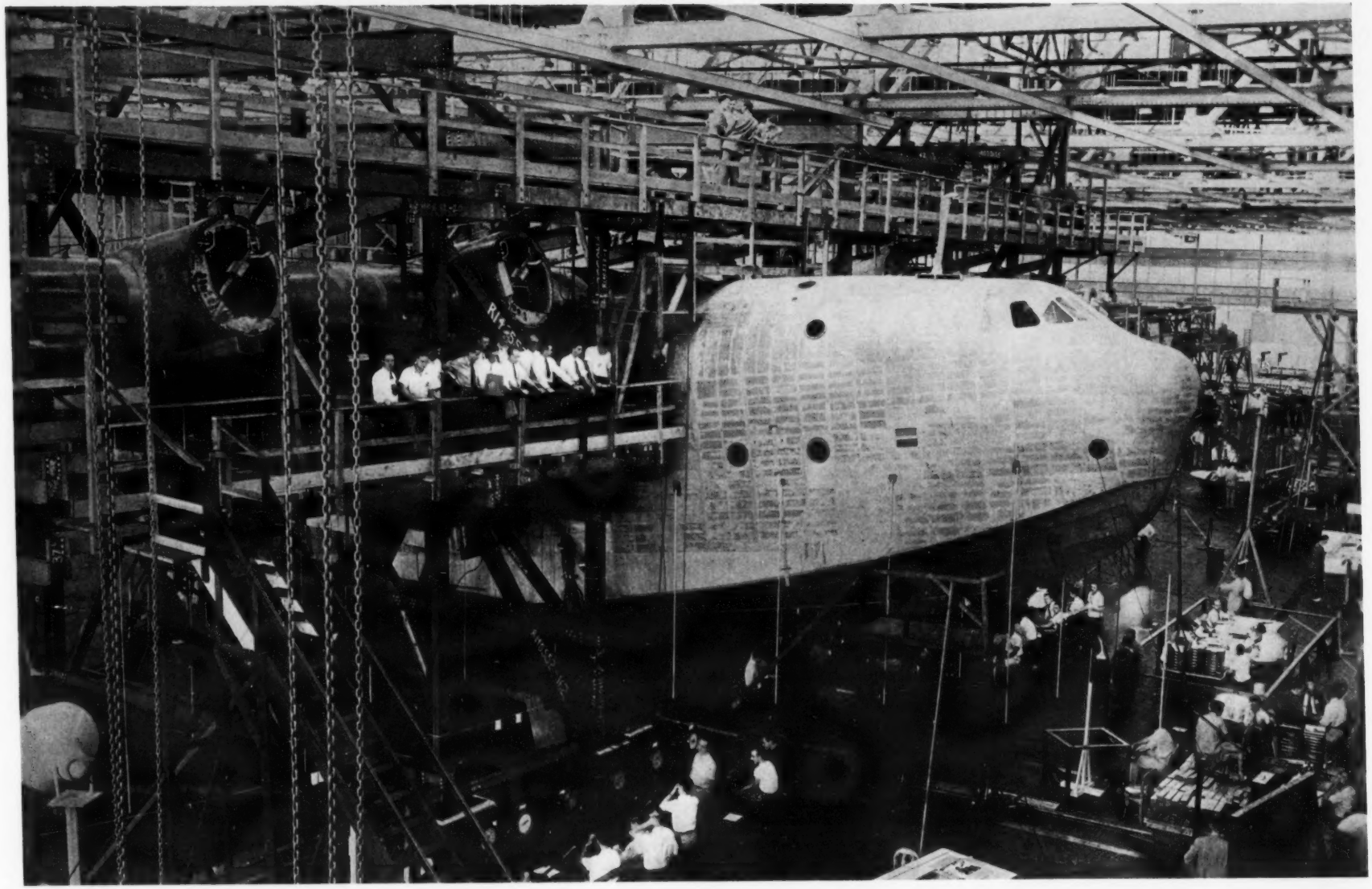

Load-testing the Martin XPB2M-1 four-engined patrol bomber in a specially constructed hydraulic testing rig at the Glenn L. Martin plant at Baltimore. (See story on page 39.)

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Government Review

IN THIS ISSUE OF THE AERONAUTICAL REVIEW, a new department on Government Publications is being introduced. It contains reviews of books, pamphlets, periodicals and similar publications issued by government agencies here and abroad.

The pressure that the defense emergency has imposed on the aviation industry has shaped activities so that the future of aviation is being forged to an ever-increasing extent by the needs of governments and their agencies.

In this new department, the editors intend to keep in touch not only with the military and civil aviation authorities, but also with all other agencies and offices which may, as part of their function, issue literature pertaining to or affecting the field of aviation. Such foreign government publications as may continue to be available will also be reported.

The section has been created to meet the needs of those readers who have suggested it. The editors wish to thank these interested readers and look forward to other contributions of thoughtful ideas on the treatment and contents of this publication.

Rushing into Print

The boom market which the publishers of aeronautical books have been enjoying during the past year has brought, along with a bumper crop of quality works, a proportionate number of aero-literary culls whose defects vary from careless writing to plain misinformation.

The percentage of these poor works remains pretty much the same as normal, but the increased number makes the cull section look large. Many of these works have considerable merit, but show signs of keeping one eye on the market and rushing into print before sufficient research or literary ear-washing could be accomplished. Others have been ground out by skilled literary hacks who have padded the market with revisions of existing works, despite the fact that they had no real qualification to write on aviation. These books frequently pick on some innocuous bit of technical misinformation gleaned from what appears to be a reliable source and, because it looked spectacular, devote large parts of their work to it. The fib is frequently exalted and the aviation industry is known to have the devil's own time erasing it from the public mind.

Putting technical material into book form involves more responsibility than appears on the surface. In times like these, young men who use printed material in their education should not be asked to "unlearn" the author's or publisher's mistakes. Close inspection of some of the older books in the Kollsman and Burden libraries is proof of the lasting qualities of works placed between covers. They remain to face the criticism of posterity, and just as the well-written work stands as a monument to both the author and the publisher, the carelessly-written, misinforming volume often remains in circulation to plague all of those responsible for its creation.

Useful Knowledge

In a recent issue of *The Aeroplane*, a contributor known as "Watchkeeper" dropped the pungent suggestion that unnecessary information is more harmful than helpful because it dilutes essential knowledge. He was referring to the type of knowledge required to serve a competent aircraft mechanic. But the thought is universal in its application, as evidenced by the consistently greater proportion of new aviation manuals, instruction books and students' texts which concentrate on *useful knowledge*.

The need for extensive background knowledge is all too omnipresent in the various branches of aviation. The greatest strides in the improvement of aircraft and of air safety have been the out-growth of an increasingly well-rounded knowledge and understanding of the factors affecting these fields of progress.

However the rate of aviation progress and the speed demanded by the requirements of national defense have logically enough developed a greater trend toward specialization than the industry has ever before experienced. Yet, the specialization that must accompany any trend toward mass production and mass service has brought with it an unprecedented coordination of the specialized branches to effect a smoothly integrated unit. It has also brought with it a realization that there are gradations in essential knowledge, whether applied to trades, engineering or management.

The growing trend in aeronautical educational literature toward the evasion of generalizations and concentration on what the specific student *needs* to know to be competent on a specific job is most gratifying to those of us who daily cull this literature and daily watch the rise of the aircraft production barometer.

News Review

August 10. New York City authorities revealed the possibility of a new $2,000,000 municipal airport being built on a 500-acre site in Queens to serve defense and civil aviation. The Civil Aeronautics Administration has offered to contribute $860,000 toward its establishment.

August 10. Major General H. H. Arnold, chief of the Army Air Forces, requested the Air Line Pilots' Association to furnish an initial group of 100 volunteers to fly airplanes between the U.S. and Britain in the daily transatlantic transport service the Army is establishing.

August 10. Brigadier General Donald H. Connolly, head of the Civil Aeronautics Administration, announced that the construction or improvement of 288 airports in the U.S. had been approved and would soon get under way.

August 10. The War Department reported the establishment of a twenty-four hour service along coast lines and at overseas bases for detecting airplanes through the use of new secret radio devices developed by the Army.

August 11. Pan American Airways added a sixth Boeing, the Anzac Clipper, to the Pacific Fleet. The new airplane, commanded by Captain J. H. Tilton, left Los Angeles on its first flight to Honolulu.

August 12. The first contingent of the six hundred Latin-American army officers to be trained at Randolph Field under a plan suggested by Nelson Rockefeller, coordinator of relations between the Americas, arrived in New York.

August 12. Army air force officials were reported to be considering the use of experienced women pilots for ferry service to deliver training aircraft from plants to training centers.

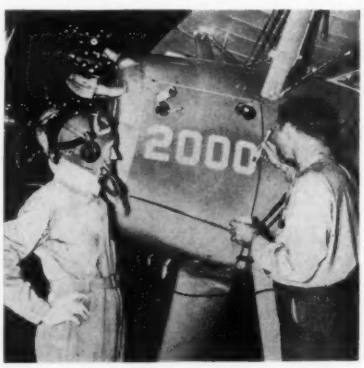
August 13. Informed congressional sources revealed that the United States was urging the Brazilian Government to assume control of the Italian operated air base at Natal.

August 14. The 1,500,000-sq. ft. factory of the Curtiss-Wright Corporation, to be used for the building of fighter aircraft, was dedicated at Buffalo, New York.

August 14. Jesse Jones, Federal Loan administrator, announced that the Defense Plant Corporation, at the request of the War Department, had signed a contract for the construction of plants at Mead, Gabbs and Las Vegas, Nevada, for the production of metallic magnesium. The plants will have a productive capacity of 112,000,000 lbs. annually.

August 15. General Douglas MacArthur inducted the six-year-old Philippine Army Air Corps into the Far Eastern United States armed forces.

August 16. Petroleum Coordinator Harold Ickes announced that the oil industry was drafting plans to double its capacity for refining 100 octane fuel.



August 27. Lt. Col. Ray G. Harris, the Air Corps representative at Boeing's Stearman Division at Wichita, accepts delivery on the 2,000th Stearman trainer built for the Army and Navy under the National Defense program.

August 16. The Brazilian Government denied the Vichy Government request for permission to operate an airline from Rio de Janeiro to Santiago via Buenos Aires. The application had been a move by Air France to reopen war-interrupted operations from Dakar to Rio.

August 17. U.S. Army engineers began work on a $20,000,000 Army Air Corps replacement depot near the site of Fort Stanwix at Rome, New York.

August 19. President Roosevelt revealed that Pan American would ferry military aircraft from the U.S. to Africa via the South Atlantic.

August 20. The War Department announced that a 1,100-acre site near Waco, Texas, had been selected for the establishment of a $4,363,000 Army Air Corps basic training school.

August 21. The Russian Government began placing large scale orders for aviation gasoline, the fuel to be shipped in drums on freighters to circumvent the tanker shortage.

August 23. The U.S. Army officially accepted the first 50-caliber Browning aircraft type machine-gun produced under a $27,000,000 contract awarded the Savage Arms Co. The first gun was finished four months ahead of schedule.

August 25. The U.S. Army Air Force received its first Curtiss P-40E powered by a Rolls-Royce Merlin 1,105-hp. engine.

August 25. A committee of U.S. airline pilots volunteered to train R.A.F. men in their spare time, it was revealed after an interview between Dick Merrill and Air Commodore H. N. Thornton of the British Embassy.

August 26. Tests of a new magnesium production process recently brought from Austria were reported at the new $12,000,000 Permanente plant at Los Altos, California. The new plant, now ready for operation, will have a productive capacity of 400 tons annually, using the new production process for the first time in this country.

August 27. The Civil Aeronautics Authority announced that it would take over traffic supervision at 39 major airports in areas where extensive military flying prevails.

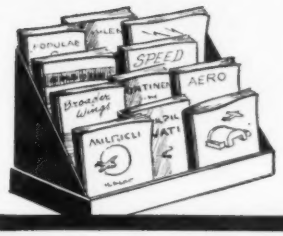
August 27. Consolidated Aircraft Corporation reported the delivery of a four-engined Liberator from Newfoundland to Ireland in seven and a half hours, averaging over 300 m.p.h. for the 2,350 miles.

August 29. Artemus L. Gates, president of the New York City Trust Company and World War naval aviator, was appointed Assistant Secretary of the Navy for Air.

August 29. Three Douglas DC-3 airplanes were delivered by air from Oakland to Honolulu in 13 hours and 55 minutes. The transports are to be used for inter-island service. This flight established a new speed record between the mainland and Hawaii.

August 31. Ground was broken near Naugatuck, Connecticut, for the

(Continued on page 47)



Periodicals

Aerodynamics

A Simplified Method for Predicting the Change in Airplane Performance Due to a Change in Parameter. Ezra C. Posner. This paper presents a method for rapidly determining the effect of small modifications in the various parameters influencing performance. The only requirements for use of this method are performance values for some basic condition and the corresponding airplane polar curve. No recourse is necessary to analytical methods of performance calculation, but only the fundamental concepts of power available and power required are used. The resulting expressions lead to some interesting corollaries dealing with critical values of the parameters. *Journal of the Aeronautical Sciences*, September 1941, pages 419–425, 4 illus.

Flutter at Altitude. J. C. K. Shipp. A discussion of the effect of true and indicated air speeds at altitude on flutter speed. Flight at altitude is said to have no very serious effects from the flutter viewpoint. The reduction of indicated speed as height increases is most marked for wings of low density. Fairly low density wings may be adopted for the large high flying air transport machines of the future with the exception perhaps of the flying wing airplane. This type, carrying loads far out in the wing, will have its own instability problems. *Aircraft Engineering*, July 1941, pages 193, 194.

The Effect of Wind Tunnel Wall Interferences on the Stalling Characteristics of Wings. H. J. Stewart. It is shown in this paper that the distortion of the lift distribution of a wing in a wind tunnel caused by the wind tunnel wall interference can be considered as an induced twist in the wing. The magnitude of this twist is calculated for a wing in a circular closed wind tunnel.

In numerical examples and an experimental check it is shown that this induced twist (washin for a closed wind tunnel working section) is large enough to cause very marked changes in the stalling characteristics of a wing unless the wing span is less than 80 per cent of the wind tunnel diameter. *Journal of the Aeronautical Sciences*, September 1941, pages 426–428, 4 illus.

The views and opinions expressed in this section are exclusively those of the writers or publications named. They are in no case to be construed as those of the Aeronautical Review or the Institute of the Aeronautical Sciences.

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Accessories

Aircraft Instrument Pumps and Compressors. F. G. Spreadbury. The design features of high precision accessories are discussed in relation to volumetric efficiency, mechanical losses and heating effects. The production of such pumps and compressors is reviewed with special attention to vane clearances, measurement of volumetric efficiency, horsepower and mechanical efficiency, isothermal efficiency, temperature and oil consumption tests, regulator valves and air intake throttles, and valve inspection and testing. *Aircraft Production*, August 1941, pages 296–298, 14 illus.

American Self-Sealing Tanks. Brief descriptive notes on the self-sealing tank developments of The Glenn L. Martin Company and the B. F. Goodrich Company. Included is an explanation of the Goodrich method for testing the tanks. *Aircraft Production*, June 1941, page 202, 2 illus.

Auxiliary Power for Large Aircraft. An outline of the development of auxiliary power units for large aircraft. It is indicated that the present trend is toward an increase of electrical power requirements for aircraft, thus increasing the amount of power required of the auxiliary power plant. The development of auxiliary power units by the Lawrance Engineering and Research Corp. is reviewed and a description is given of the Lawrance model 30C unit, its design and specification. *Aero Digest*, September 1941, pages 198, 201, 6 illus.

New Developments in Ice Elimination Equipment. David Gregg and Myron L. Taylor. Outline of recent developments in aircraft anti-icer and de-icer equipment as a result of the increasing severity of demands on ice elimination systems caused by a greater amount of long-range and trans-oceanic flying under all weather conditions. Changes in the inflation and deflation plus the addition of a "jump valve" are described. Also explained is a venturi arrangement which relieves a load from the suction side of the air pumps in the "off" position and at the same time produces suction necessary to hold the de-icers deflated. Equipment changes neces-

sary for de-icing at higher altitudes are also discussed. *Aero Digest*, September 1941, pages 154, 157, 158, 255, 8 illus.

Air Cargo

"I Saw the Heavens Filled With Commerce..." An explanation of the freight forwarder service recently begun by Universal Air Freight Corporation. This service represents an effort to establish air cargo on a volume basis in this country. It is pointed out that the ability to carry air cargo as well as passengers in volume is the very basis of air strength, and that airline equipment should be quadrupled immediately rather than curtailed by a single airplane. *National Aeronautica*, August 1941, page 13, 1 illus.

Flying Box Cars. Allan Finn. A review of the development of air freight in the United States and an evaluation of the present status of the air freight field. An estimate of its future is discussed in relation to national defense needs and post-war conditions with the observation that "whether we get in the war or not, cargo ships are bound to take up the slack of military production when the conflict is over." *Air Trails*, August 1941, pages 28, 29, 38, 39, 7 illus.

Air Policy

Standardization in the Aircraft Industry. Glen M. Aron. The assistant chief engineer of North American Aviation, Inc., recently appointed a member of the executive board of the National Aircraft Standards Committee, outlines the objectives and function of the committee, with an analysis of the need for "the right apprehension of standards in the manufacture of airplanes." *Western Flying*, August 1941, pages 44–46, 5 illus.

Airplane-Minded Generals. C. B. Allen. Observations on the subject of special airplanes assigned to Army generals for their personal use in the course of staff duties. It is noted that when a predominantly groundling General Staff exercised essential control over military aviation it was "an intelligent and constructive policy to make the key officers in other branches of the Army air-conscious by carting them around and demonstrating the advantages of the airplane." But, the shortage of airplanes and pilots coupled with the urgency of national defense needs is said to preclude the reasonability of catering to personal requirements.

It is suggested that instead of the present 70 airplanes tied up in such service it would be more than sufficient for justifiable needs to assign not more than four craft outside of the Army Air Forces—one to the commanding general of each of the four armies. The needs of lesser generals could be met by organizing a pick-up-delivery service with airplanes assigned to the Air Corps' new maintenance command, permitting full and effective use of all airplanes required for staff service. *Western Flying*, July 1941, page 21.

Byrd Bares "Secret" Production Figures. A report of the stand taken in Congress by Senator Harry F. Byrd with regard to publicity on defense progress. He has said that his criticism of defense production applied not to the aircraft manufacturing industry, "which has cooperated to the fullest," but to the Washington administration of the defense effort. He is urging "full publicity" on defense progress in the belief that the defense effort will be stimulated by publication of the "actual facts" on production. *American Aviation*, September 1, 1941, pages 1, 15.

U.S. Must Take Care How It Attacks German Air Systems in South America. Meigs M. Green. Observations on Condor-Lufthansa flying experiences of the writer in the light of information circulated in this country concerning the "unfair" competition of the German airline in South America. It is said that much of such information "does not correspond to the facts," and that "the public interest in some Latin countries involved is best served by competition and Latin-American public opinion is mighty important right now." *American Aviation*, September 1, 1941, pages 40, 41, 2 illus.

Why an Air Force? Col. Robert Olds. An analysis of some of our hemisphere defense problems which call for the maintenance of a large air force. Recent encounters between aircraft and battleships are cited to show the power of this new arm. It is said that by the time our present pilot training and aircraft building program is completed, we will have an Army air force about half the size of the German *Luftwaffe*. *Flying and Popular Aviation*, September 1941, pages 34, 39, 1 illus.

Why Worry About Sales? J. Caden Jenkins. The sales promotion manager of the Lockheed Aircraft Corporation examines the need for continued sales and advertising during wartime. The article points out the economic and psychological factors which demand a vigorous sales policy and continued promotion of aviation products throughout wartime if the industry expects to avoid post-war deterioration. *Western Flying*, August 1941, pages 22–24, 4 illus.

Air Power

Japanese Air Power. Lucien Zacharoff. An appraisal of Japanese air power, this article describes the equipment, facilities, training and organization of Japan's air force. Local as well as international factors affecting the strength and status of Japanese air power are analyzed. Particularly noted are Japan's inadequate industrial facility and organization for the production of airplanes and the country's technical inferiority, especially evidenced in the inadequacy of machine tools. *Aviation*, September 1941, pages 48, 49, 146, 148, 150, 8 illus.

Russian Air Power—I and II. An analysis of available information on the strength, organization and condition of Russian air forces. The most reliable estimate of unit strength is said to indicate about 8,000 "first line" airplanes, of which about 900 are seaplanes. The total strength is estimated at about five times this figure. Maintenance on the ground is held to be the weakest point in the organization of the Russian air fleet.

It is pointed out that the quality of Russian airpower is not high, but the fleet gained much operational experience in Spain and in Finland and has had a year in which to apply these latest lessons and to study the experiences of the current war in France and over England. The strategic plan of Russian air power organization and operation is described in a breakdown under tactics and types of equipment. Drawings and a table of data illustrate and describe the known types of Russian military airplanes. *The Aeroplane*, July 18, 1941, pages 78–81, 15 illus.; July 25, 1941, pages 94, 95, 4 illus.

The Soviet Air Force. A speculative survey on the strength of the Soviet air force, giving the consensus of British opinion on the types of aircraft available and the political and military situation that may contribute to the present strength or weakness of the organization. *Flight*, July 3, 1941, pages 6f–h, 6 illus.

Britain's Air Might. A brief note comparing former and present day types of airplanes used by the R.A.F. The comparison is made from the standpoint of the revolutionary progress in R.A.F. equipment and operations over a relatively brief period. *Indian Aviation*, March 1941, pages 57, 58.

Ein Rätsel wird gelöst (An Enigma Is Going to Be Solved). Notes on the Russian air force, describing several

airplane types which are known to be in use. As far as its actual strength is concerned, it is said that nobody knows but the Russian and probably the German General Staff. Estimates without background assume that Russia has about 5,000 military airplanes, half of which are modern.

It is said that in any case Russia has all the machines and organizations necessary for modern warfare, and has them in large quantities. The near future will reveal the condition they are in, how they are applied and how the replacements will turn out. *Schweizer Aero-Revue*, July 1941, pages 17–20, 3 illus.

Air Transport

Our Future in the Air. T. B. Wilson. The chairman of the board of T.W.A. considers the future of "commercial air power." The importance of commercial as well as military air power is stressed as essential to national strength and security. Allusion is made to British, German, Italian and Japanese recognition of the importance of such coordination as evidenced by their continued surveying of new routes and installation of new services in the midst of wartime.

Progress in the development of commercial airplanes and air service is shown to have kept pace with American military aviation progress. But, it is urged that normal growth, expansion of new routes and services by American commercial airlines, should continue and can do so without interfering with immediate needs of national defense. The World War I experience of the United States in finding itself in the midst of war without adequate merchant marine is pointed out as a warning.

Besides continued expansion, an obligation of commercial aviation is the development of an air transport system which can be converted into a military transport service in any emergency. It is indicated that experiments have already been undertaken in this kind of mobilization; the airlines are prepared to move a division of men from Texas to the Panama Canal in less than a week, and 5,000 men could be moved overnight.

But, pending need for this kind of outright military service, the job of commercial air transport in the United States is to maintain vital services for those traveling on urgent defense business necessary to the operation of our entire industrial mechanism. Any letup in airline service will tend to slow down the output of industry and clog the efficiency of our program of national defense production. Protection and encouragement of this service is urged as a paramount defense factor. *Western Flying*, August 1941, pages 18–21, 48, 9 illus.

Ground Handling of Air Express. Arthur Dee Lewis. Outline of a plan whereby the airlines would maintain and operate their own air express service. Problems of the present system in which the air lines carry the cargo and the Railway Express Agency handles shipments on the ground and is in charge of sales promotion and traffic solicitation are described. These are said to be a laxity in solicitation of traffic, high rates on small shipments, lack of uniformity of rates, as airlines now set their own individual rates, and general lack of coordination in air cargo development. A plan is suggested for common ownership of an air cargo company which would have control of air and ground handling as well as sales effort. *Aero Digest*, September 1941, pages 72, 76, 260, 264, 265, 266, 269, 2 illus.

Engineering Planning for Post War Expansion. William B. Stout. Discussion of the necessity of scientific planning for the change-over from wartime aircraft production to an orderly expansion of civil aviation and private flying. The writer foresees the possibility of private flying alone growing into an industry as large or larger than the motor car industry. The expansion of air cargo, air mail, and other forms of air transport is also discussed. *Aero Digest*, September 1941, pages 134, 135, 256, 1 illus.

A Bird Flies on One Wing and a Half. Capt. Edward Smith. An account of an interesting incident in the airline operations of China National Aviation Corp. A DC-3 airliner, bombed at Suifu, China, about 860 miles from its base at Hong Kong, lost a wing in the air raid. The only replacement wing available at the C.N.A.C. base was one for a Douglas DC-2 airplane. This was lashed below the fuselage of another craft, flown to Suifu and fitted to the damaged DC-3, which then flew to Hong Kong without incident. The flight with two wings of different size is described. *Aviation*, September 1941, pages 61, 186, 4 illus.

Airplane Descriptions

New Howard Trainer. A description of the new Howard training airplane, model DGA-160, designed especially for secondary and instructor courses of the Civilian Pilot Training Program. Increased performance features this improved model which is to supersede the previous trainer now used by operators. Specification and performance figures are given along with other details on structure and design. *Aviation*, September 1941, page 91, 2 illus.

Nazi Nemesis. The Bristol Beaufighter, armed with four cannon and six machine guns, is said to have the most powerful armament of any fighting airplane in the world. This article describes the structure and design of the Beaufighter, which has a maximum speed of 330 m.p.h. and a range of 1,500 mi. *Aviation*, September 1941, pages 93, 172, 3 illus.

Aviation Sketch Book of Design Detail. Cutaway drawings and captions describing the improved exhaust system on Luscombe airplanes, the engine mount on the Lockheed P-38 interceptor, the DB-601 engine installation in the Messerschmitt 109, the landing gear retracting mechanism on the Boeing Flying Fortress, the Beechcraft 18-S wing and the stabilizer adjustment mechanism used on the Piper J3 trainer and J5 cruiser. Other drawings point up features of the Messerschmitt 110-C multi-purpose fighter, the General Aircraft Skyfarer and the Rolls-Royce Merlin 1,030 hp. power plant installation in the Supermarine Spitfire. *Aviation*, September 1941, pages 78, 79, 81, 9 illus.

Plxweve CT-6A Trainer. Curtiss L. Bates. The chief engineer of the Plxweve Aircraft Company reviews the development of geodetic construction of light aircraft, using spruce strips spiraled around laminated bulkheads, and bonded at each joint and intersection with phenolic resins and urea formaldehyde glues.

A description is given of the Plxweve CT-6A, a two-place, low-wing trainer powered by a Continental 75 hp. engine. The airplane has a cruising speed of 120 m.p.h. and lands at 47 m.p.h. It has passed the static load tests and is now completing its flight tests. Details of design and construction are outlined. *Aero Digest*, September 1941, pages 194, 197, 7 illus.

Mercury "Aerobat" Trainer. The BT-120 Aerobat, built to meet C.P.-T.P. requirements, is now in production at the plant of Mercury Aircraft Company, having received its C.A.A. type certificate. It shows several innovations in design, though adhering closely to conventional construction. It is a two-place biplane stressed to take power plants up to 150 hp. This article presents a full

description of the airplane and gives performance and specification figures. *Aero Digest*, September 1941, pages 210, 259, 2 illus.

Pilot Praises B-19's Performance on Initial Test-Hops. A report of some of the early test results of the B-19's early tests. A description of the airplane's structural features includes data on design, construction and performance. *Commercial Aviation*, July 1941, page 52, 1 illus.

Fighters of the Far East. An account of the defense role performed by Brewster Buffalo airplanes for the R.A.F. at Singapore and the Netherlands East Indies Air Force at Batavia, Java. Characteristics of the airplane are briefed along with data on its shipment to the Far East and its assembly on arrival. *Western Flying*, August 1941, pages 30, 31, 7 illus.

The Sportsman Test Pilot. James B. Taylor, Jr. A description of the flying characteristics and performance of the geared Lycoming 75-powered General Skyfarer. Expressing marked enthusiasm regarding its handling in flight, the writer points out flight characteristics peculiar to this particular airplane as an aid to those flying it for the first time. *The Sportsman Pilot*, August 15, 1941, pages 14, 15, 46, 1 illus.

"Rocking Wings" Take the Bumps Out of Flight. A brief description of the radical design for a private airplane nearing completion at a factory in Dayton. The new craft is a low-wing monoplane using an extreme reversed stagger, which gives the appearance of a reversed arrowhead when viewed from above. According to its designer, George Cornelius, the wings are mounted so that they can rock on their horizontal axis. Thus they will compensate automatically for windstream variations. The main plane is built to rock on a main member inside the wing. *Popular Mechanics*, August 1941, pages 60, 61, 5 illus.

The Brewster "Buffalo" Fighter. Description of the Brewster F2A-2 mid-wing fighter, which has gained an enviable reputation abroad for performance, maneuverability, and firepower. The Brewster is manufactured in the only two multi-storied plants in the United States devoted to the production of aircraft. Powered with a 1,100 or 1,200 hp. Wright Cyclone engine and equipped with the Curtiss electric propeller, the Brewster's speed is approximately 350 m.p.h. with full military load. Flight characteristics and details of armament and construction are also outlined. *Aero Digest*, September 1941, pages 185, 186, 7 illus.

Airports

Magnetic Bearings for Runway Numbering. An explanation of the C.A.A.'s recently revised system for numbering and marking airport runways. The advantages of the new system are pointed out along with suggestions for converting runways to conform to it. *National Aeronautics*, August 1941, pages 18, 19, 2 illus.

Washington National Airport. John Groves. The manager of the new field at Washington, D. C., explains the general layout and plan of the airport and describes the nature and purpose of many new features used at the airport in the improved handling of both passenger and airplane traffic. *Aviation*, September 1941, pages 58–60, 11 illus.

Large-Scale Improvement Program Modernizes Strategic Airports. A review of construction details and activities at strategic airports throughout the country. *Aero Digest*, September 1941, pages 88, 90, 94, 98, 260, 8 illus.

Konshin—Emperor of the Camp. George H. Copeland. An interesting account of the building of Barreiras Airport, which was literally "carved from the heart" of the Brazilian jungle. The importance of the airport lies in the fact that it cuts a thousand miles off the airway from America to Rio and the Argentine. The many technical, supply and transportation difficulties encountered in the construction are described. Considerable credit is given to George Konshin, the man who built the airport. *Aviation*, September 1941, pages 50, 51, 170, 172, 7 illus.

A Plywood Hangar. Emil K. Harvey. The director of the airport division of The Haller Engineering Associates describes a plan for a plywood airplane hangar—a simple structure, quickly erected. The manner in which the plan was evolved is explained along with details about the construction. An editor's note appended to the article suggests that a conventional size T-hangar so constructed would require from $325 to $375 for material and somewhere between eight and ten hours of labor, the charge for which would vary locally. *The Sportsman Pilot*, August 15, 1941, pages 30, 32, 2 illus.

Armament

Guns Win Battles. Tracy Richardson. A gunnery instructor outlines the requirements and duties of the air marksman, who "first of all must know his equipment." The characteristics of airplane armament and facts peculiar to the use of this type of gunnery equipment are described briefly. *Air Trails*, August 1941, pages 20, 30, 32, 4 illus.

Armament. Maj. Franklin C. Wolfe. A discussion of changes in American military aircraft armament brought about by the present war. Development work being done at the Armament Laboratory, Wright Field, is also reviewed briefly. *Flying and Popular Aviation*, September 1941, pages 92–94, 214, 9 illus.

Avigation

Navigation With the D/F Loop. C. H. McIntosh. The instructor in charge of American Airlines' Chicago pilot training school expounds the basic principles of the radio direction finding loop and its application. *Aviation*, September 1941, pages 52, 53, 158, 160, 162, 8 illus.

Astronomical Avigation. Frederick Harrison Tregenza. The seventh and final article in this series discusses the study of the compass, its use and care. Particular attention is given to deviation, correcting for variation and deviation, the effect of the wind and the northerly turning error. *Commercial Aviation*, July 1941, pages 35, 36, 38, 50, 6 illus.

Eenvoudige Navigatie ten dienste van de Sportvliegers (Simple Navigation for Sports Fliers). J. W. Verhoeven. The fifth and sixth of a series of articles on airplane compasses. These installments deal with compass errors and their compensation. *Luchtvaart*, June 17, 1941, pages 236–238, 2 illus.; July 1, 1941, pages 254–256, 2 illus.

Above 3,500 Ft. David S. Little. Beginning July 1, 1941, all aircraft flying on or across the civil airways at altitudes of 3,500 feet or more above ground, became required to carry two-way radio equipment plus a sensitive type altimeter. Filing of a flight plan and proper execution of that plan are also required, together with reports by radio on flight progress. The changes which this ruling entails are discussed in addition to equipment needed and the procedure of filing and following a flight plan. *Aero Digest*, September 1941, pages 81, 82, 252, 6 illus.

New Link Octant and Collimator. A description of two new instruments for aircraft use developed by Link Aviation Devices, Inc. The Link bubble octant, model C-9, has been designed particularly for light weight and correct balance, eliminating muscular exertion and making accurate observations easier to obtain. This model is equipped with an averaging device. Adjustment of the octant can be made by use of the new Link

collimator for checking, testing and adjusting octants. The design and operation of both instruments is explained in detail. *Aviation*, September 1941, pages 82, 84, 4 illus.

Flying After Dark. Bradley D. Pischel. An outline of the problems peculiar to night flying and practical guidance in the elements of night flight. *Western Flying*, August 1941, pages 26, 27, 50, 3 illus.

The Relationship of Wind Correction Angle to Drift Angle. W. S. Alexander and O. M. Klose. This paper treats mathematically the relationship between correction angle and drift angle and derives a formula for the relationship. It is found that the correction angle is less than, equal to or greater than the drift angle according as the groundspeed (as observed when heading on the desired course) is respectively less than, equal to or greater than the airspeed. *Journal of the Aeronautical Sciences*, September 1941, pages 409–412, 4 illus.

Civil Air Defense

1st Air Squadron Florida Defense Force. Art Keil. An account of the state air defense unit already set up in Florida as a preliminary to the much-discussed but as yet embryonic national civil air defense organization. *The Sportsman Pilot*, August 15, 1941, pages 12, 34, 2 illus.

Colorado's Civil Air Reserve. R. P. Arentz. Description of Colorado's civil air organization as a forerunner to the state's participation in the as yet unorganized national civil air defense program. *The Sportsman Pilot*, August 15, 1941, pages 13, 34, 35, 36, 2 illus.

Civil Aviation Requests Clearance. Gill Robb Wilson. The president of the National Aeronautic Association interprets the nature and extent of civil aviation's resources and desire for participation in national and civil defense. A national plan is needed to build up and coordinate the defense service which civil aviation can and should perform.

With this objective in view, a method of organization is suggested whereby it is thought that civil aviation can effectively be formed and operated for this service, one of the prime duties of which would be to control the danger of sabotage and subversive activity by air. A training program and service objectives are set forth. *National Aeronautics*, August 1941, pages 21, 22, 1 illus.

Aerial Observations. This editorial column notes recent developments in the manufacture and use of lightplanes and the need for an organization of a national civil air defense service to employ the extensive and highly useful resources which civil aviation can provide. Also noted is the favor with which military lightplanes were employed during recent military maneuvers which presaged the potential military value of the light airplane type. *The Sportsman Pilot*, August 15, 1941, pages 5–7.

Design

Analysis of Extension Shafts and Nose Sections. George W. Tweney. A discussion of the design problems of extension shafts and nose sections, together with a method of analysis for both installations. *Aero Digest*, September 1941, pages 168, 170, 3 illus.

Tolerances for Aircraft Parts. H. G. Conway. A summary of the findings of the writer following recent research into the problem of manufacturing tolerances for aircraft parts. The report constitutes notes on existing practice and a proposed system of modified B.S.I. unilateral standards on the lines of the I.S.A. metric system of tolerances. The information given is offered as a guide to drawing offices and shops engaged in the production of precision aircraft components which can be classed as mechanical rather than structural parts. *Aircraft Production*, August 1941, pages 281–283, 3 illus.

Tricycle-Undercarriage Take-Off. E. John Andrews. An analysis of the forces acting on the airplane and other phenomena. The take-off of a tricycle-undercarriage airplane is carefully analyzed, including the effects of slipstream. Wheel position relative to the center of gravity is shown to have an important effect on the take-off run and flaps may or may not adversely affect the run. Elevator power should be high yet light enough to provide adequate control at the take-off speed. *Aircraft Engineering*, July 1941, pages 180–183, 9 illus.

Pursuit. Maj. Hoyt Vandenberg. Modern fighters and trends in modern fighters are discussed in relation to the tactical requirements which will soon call for operation at higher altitudes and longer ranges and necessitate greater fire power and defensive armor. These necessities make the modern fighter heavier for its size than is a battleship.

It is said that far heavier, multi-engined fighters with increased range, fire power and armor are in the design stage. *Flying and Popular Aviation*, September 1941, pages 54–62, 14 illus.

Aircraft Lighting. Norman J. Clark. A brief analysis of aircraft lighting problems with special reference to the illumination of instrument panels. *Western Flying*, August 1941, pages 32, 33, 4 illus.

Continuous Beams. W. L. Morse. A simple method is presented for obtaining quick approximations in order to eliminate the tedium of working out the three moment equations for the solution of beam problems. Diagrams are presented in which the reactions and fixing moments at the supports and the maximum bending moments at intermediate points have been set down for a distributed load uniformly spread over each of two to five equal spans.

As a quick approximation, the loading in many instances can be considered as uniformly distributed and the diagrams can thus be used for a rapid check on the strength of the beam in bending, and also to determine the effect of using intermediate supports. *Flight*, July 3, 1941, pages 7–10, 7 illus.

Vertical Flight Has a Future! A presentation suggesting the commercial, public, general and military and naval uses to which the helicopter lends itself for practical development. Drawings illustrate the adaptation of the helicopter to these uses and a cutaway sketch explains the essential features and controls of the Sikorsky VS-300. *Air Trails*, August 1941, pages 22, 23, 7 illus.

The Fetish of Finish. "Watchkeeper." Notes on the questionable importance of highly finished aircraft components. American airplane manufacturers are commended for the fact that their craft reveal concern for the common problems of simplified production, operation, maintenance and servicing, and for the fact that they seem to aim at a balanced design in preference to high finish.

"It is misleading to make comparison between the two nations' airplanes based on the fetish of finish," says the writer in commenting on the British over-emphasis on finish. An analysis is given of the American design and production developments so conducive to simplicity and well-balanced design, which it is suggested the British "would do well to note and copy." *The Aeroplane*, July 4, 1941, page 13, 1 illus.

Engines

Liquid or Air-Cooled Engines? Maj. Gen. George H. Brett. The Chief of the Army Air Corps, in answer to the "so-called controversy" over liquid as opposed to air-cooled types of engines, writes that we need all we can get of both and explains why large quantities of both are

needed in a properly balanced air force. It is pointed out that each of these two types of engine has its specific and suitable applications: an air-cooled engine, scientifically cowled and having frontal area not greater than that of the fuselage, will, generally speaking, add very little to a large airplane's total drag, whereas slender streamlined engines of the liquid-cooled type particularly lend themselves to use on slender airplanes, such as fighter aircraft. *Aviation*, September 1941, pages 46, 47, 4 illus.

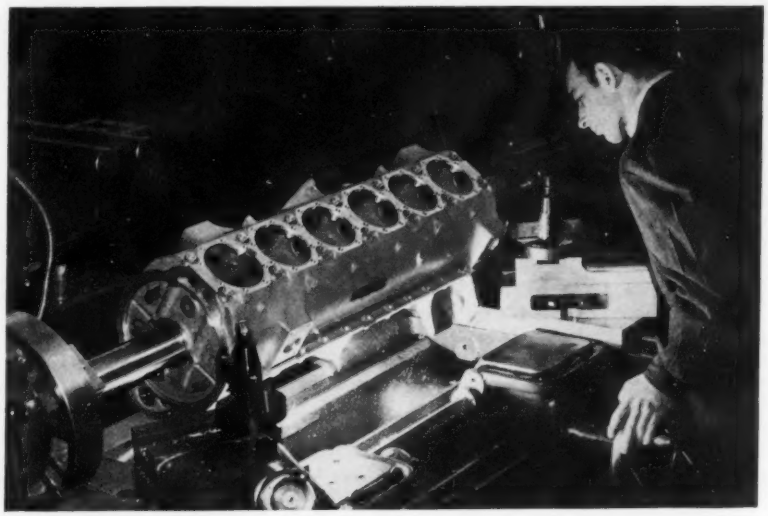
Stress and Deflection in Reciprocating Parts of Internal-Combustion Engines. R. L. Boyer and T. O. Kuivinen. This paper presents a consideration of stresses and deflections in reciprocating parts of internal-combustion engines from the viewpoint of the heavy-duty engine builder. The writers give suggested rules for design of pistons, piston pins, connecting rods and piston rods, bolts and connecting-rod caps. All recommendations given are based on what has proved to be successful practice in this classification of machinery. *Transactions of the A.S.M.E.*, August 1941, pages 499–504, 5 illus.

Angaben über meine Versuche mit Rückstossmotoren (Data on Experiments With Rocket Engines). J. Stemmer. An account of the author's experiments in developing a rocket engine for liquid fuel. The engine was developed from a crude start, using a home-made test stand. Tests were carried out for the measurement of the recoil force, measurement of the exhaust velocity of the combustion gases, heat conditions, injection and turbulence of fuels, fuel mixtures and various shapes of expansion jets.

Fuels investigated were: gasoline-air mixture, gasoline-oxygen, alcohol-oxygen, acetylene-oxygen, hydrogen-oxygen. These fuels were used in a liquid state, except acetylene and hydrogen. Combustion pressures reached were up to 50 atm. absolute pressure; exhaust gas velocities up to 3,800 meters per second. The engine was installed in a remote controlled flying model and showed good results in higher altitudes. *Schweizer Aero-Revue*, June 1941, pages 14–16, 6 illus.

Superchargers for High Flight. Notes on the development of aircraft superchargers to enable the engine to "breathe" in the sub-stratosphere. The principles of supercharger design and functioning are explained. *Canadian Aviation*, July 1941, pages 20, 21, 30, 3 illus.

Carburation. Alex Lavendal. Part 1 of an outline of the development of the modern carburetor, which began to take shape in 1914. Developments to date and problems still to be solved under pressure of military aircraft requirements are discussed. *Commercial Aviation*, July 1941, pages 30–32, 46, 4 illus.



Facing the flange fits for the front and rear sections of the crankcase of the Ranger 6-440C engine at the Ranger Aircraft Engines Division plant at Farmingdale, Long Island.

Power Plants. Lieut. Col. Edwin R. Page. A review of aircraft power plant development and of the engine and propeller test and research carried on at Wright Field. Test sequence and procedure on a new engine is outlined together with some of the current development work being done on multi-bladed propellers for high-powered engines. *Flying and Popular Aviation*, September 1941, pages 116, 117, 158, 160, 164, 168, 6 illus.

Modern Aircraft Valves. A. T. Colwell. The final installment of a review of American and European developments which have contributed to the evolution of the efficient valves in use today. In concluding, the writer indicates that although occasional troubles are to be expected, aircraft valve performance today is highly satisfactory. "As we see the situation at the present time, valves can meet any requirement imposed upon them for some time to come." *Commercial Aviation*, July 1941, pages 43–45, 4 illus.

Housing a Hurricane. Walter Brehm. Popularized description of the Wenner-Gren Aeronautical Laboratory of the University of Kentucky. The new laboratory, of special design for the testing of aircraft engines and propellers, will serve as a power plant branch for the Army Air Forces program of training and research. Laboratory design and layout are also described. *Popular Science*, September 1941, pages 73–75, 4 illus.

Drag and Cooling of Air-Cooled Engines—I and II. P. E. Mercier. A translation from *La Science Aerienne* of September-October 1938. The article explains the considerations which led the writer to evolve the Mercier low drag cowling, primarily the desire to have a nacelle as close as possible in shape to a streamline body, which orthodox cowlings are not. With normal ducting this would lead to inadequate cooling. This problem is solved by the use of reverse flow ("two-stage cooling") and by having the exit near the nose, a design which is claimed to improve flow both inside and outside the cowling. Adjustment is obtained by sliding the nose portion forward or back. *The Aeroplane*, July 4, 1941, pages 21, 22, 24, 7 illus.; July 11, 1941, pages 48–50, 8 illus.

Development Problems of Light Aircraft Engines. Carl T. Doman. A discussion of various factors affecting and governing Aircooled Motors Corporation's development program for the production of a series of engines at an economical cost and ranging from 65 to possibly 400 hp. The development was undertaken to meet the trend of increasing power requirements for smaller airplanes. *Journal of the Aeronautical Sciences*, September 1941, pages 413–418, 5 illus.

Fuels and Lubricants

Pan American's Fuel Testing Laboratory. A description of the methods by which Pan American Airways provides a guaranteed fuel supply for the airplanes which operate over its 72,000 miles of airways. At Pan American Airways International Air-

port in Miami, Florida, a fully equipped fuel testing laboratory checks samples of gasoline from scores of airports, all over the world. The methods of testing and standards maintained by the testing are explained. *Aero Digest*, September 1941, pages 202, 204, 259, 4 illus.

Purification of Cutting Oil. A discussion of centrifugal purifiers for effecting economies in the purification of machine cutting oil. Oil is removed from the circuit of each machine in the form of a film retained on the metallic chips, turnings and dust, and a large proportion of this is recovered by whizzing the swarf in a hydro-extractor. The oil discharged from this centrifugal machine is in a comparatively dirty condition, and must therefore be clarified before return to clean oil storage.

Clarification is done in a high-speed centrifuge. It is suggested that the necessary sterilization of cutting oil can be effected by heat-treatment which is conveniently combined with the operation of centrifuging. The usual method for the combined operation is described. *Aircraft Production*, August 1941, page 271.

Gliding and Soaring

New Glider Plans Would Provide Fuel, Lift for Bombers on Take-Off. James L. Straight. A report on forecasts of glider uses said to be far more revolutionary than their proven utility as troop transports. As a result of recent U.S. and British Air Corps activities, plans are understood to be in process for the development of gliders as gas tanks, towed by bombers which are refueled from the glider after take-off, and for the use of gliders to assist the take-off of bombers by exerting additional lift just as the towing bomber takes off.

The feasibility of such glider uses is noted with comment on definite Air Corps interest in glider potentialities. Air Corps interest is said to be concentrated on transport possibilities rather than primary flight instruction uses. *American Aviation*, September 1, 1941, page 6.

Up From Harris Hill. Kendall K. Hoyt. An informal account of the field and events at the 12th Annual Meet of the Soaring Society of America, held at Elmira in June. *National Aeronautics*, August 1941, pages 9–11, 41, 3 illus.

The Soaring Meet. Martin Green. Report on the Twelfth Annual National Soaring Contest at Elmira last July. Particularly noted is the impetus given glider enthusiasts by Maj. Gen. H. H. Arnold's comments on the Army's interest in the military potentialities of soaring. *Yankee Pilot*, August 1941, pages 10, 17.

Gliders Fill a Need. Alexis Dawydoff. Notes on the value of glider flying. The writer contends that a power-plane pilot who has a knowledge of soaring will make a better and safer pilot. Several instances are cited in support of this conclusion. *Air Trails*, August 1941, pages 21, 30, 4 illus.

Fighter Pilots Try New Wings. A review of the renewed interest in gliding and soaring on the part of the Army and Navy. Service pilots are being given training courses, and experimental designs for troop and cargo-carrying gliders are being developed. *Popular Science*, September 1941, pages 60–65, 10 illus.

High-Altitude Flying

Supercharged Pilots. John R. Hoyt. An account of the new technique, equipment and "even diet" being developed for pilots as a result of the increasing trend toward higher flight strata and the consequently increased protection that is necessary to assure the endurance and perception of high-altitude pilots. *Air Trails*, August 1941, pages 14, 15, 33, 36, 3 illus.

Waarom naar de Stratosfeer (Why Into the Stratosphere)? O. W. P. Mohr. The third of a series of articles on actual stratosphere flights. It explains why the construction of stratosphere balloons has to be different from that of conventional balloons. Included are data on Picard's three stratosphere flights and a description of the flight of the Russian balloon "Ossoaviachim." *Luchtvaart*, June 17, 1941, pages 232–234, 2 illus.

History

Boeing—An Industry Portrait. Selby Calkins. In this article the editor of *Western Flying* joins the many writers who have recently honored the twenty-fifth anniversary of the Boeing Aircraft Company by a review of the company's history and progress during the quarter century since 1916. This account correlates the events and personalities dominating the company's growth and punctuates the history with interesting descriptions and comparisons of successive improvements in Boeing airplane construction and design. *Western Flying*, July 1941, pages 22–25, 46, 48, 10 illus.

History of the Air Forces. Marguerite Jacobs Heron. A short chronology of events and activities of the Army Air Forces since the first aeronautical section of the Signal Corps was decided upon in 1907. Included are activities during the World War, and many record-breaking flights during the 1920's. *Flying and Popular Aviation*, September 1941, pages 40–44, 14 illus.

Parachutes. Frank G. Manson. A brief history of the development of parachutes. Included are descriptions of various types of parachutes in Army use today. A few famous first jumps are noted. *Flying and Popular Aviation*, September 1941, pages 114, 115, 168, 172, 174, 178, 6 illus.

Eastbound Transatlantic "Trip 1" in a Bomber—22 Years Ago. A reminiscing account of the first eastbound transatlantic flight, made by Sir Arthur Whitten Brown and the late Sir John Alcock on June 15, 1919. The flight was made in a Vickers-Vimy bomber—a distance of 1,890 miles, non-stop, in the official time of 15 hours and 57 minutes. *Commercial Aviation*, July 1941, page 54, 1 illus.

Hydraulics

Airplane Hydraulic Systems. Edward M. Greer. An analysis and explanation of the design and operation of modern hydraulic systems for airplanes. Although the hydraulic system in airplanes was developed primarily to permit the retraction of landing gear, its applications in airplane design have been extended to include the tail wheel, wing flaps, gun turrets, bomb doors, engine cowling flaps, gun-firing gear, control surfaces, engine controls and the automatic pilot. All these units are now controlled by a single power unit and a system of valves and actuating cylinders. The individual and coordinated action of the hydraulic system in controlling these various units is explained. *Aviation*, September 1941, pages 70, 71, 152, 154, 156, 162, 5 illus.

Aircraft Hydraulics. Part II. James E. Thompson and Rodney B. Campbell. The second in this series of articles on hydraulically actuated systems in aircraft treats of the operation of power hydraulic systems and emergency operation provisions, with descriptions of engine-driven pump, automatic pressure regulator and selector valves. *Western Flying*, July 1941, pages 26–28, 50, 52, 11 illus.

Aircraft Hydraulics. Part III. J. E. Thompson and Rodney B. Campbell. The third in this series, this article treats of the designing of the basic hydraulic system in aircraft. It discusses the geometry and mechanics of the mechanisms, system pressure and fluid delivery and the selection of the system units. Also given are more specific data on basic line sizes, wing

flap cylinder and reservoir design. *Western Flying*, August 1941, pages 39, 40, 42, 54, 6 illus.

Instruction

C-C Course. R. P. Arentz. A description of the cross-country training course of the Civil Pilot Training Program. A part of the story is given to an account of a flight by the writer in a Spartan Executive on a cross-country hop with students and instructor. *The Sportsman Pilot*, August 15, 1941, pages 17, 32, 3 illus.

Canada's Air Cadets. A report on the state of Canada's junior air force. Its training program is said to be getting well into shape, with an initial enrollment of 25,000 expected. The R.C.A.F. ground course is to be studied by the group. *Canadian Aviation*, July 1941, page 27, 2 illus.

Training Bomber Pilots. A description of the training of pilot crews for Blenheim Mk I bombers. Despite the number of pilots and crews needed by the R.A.F., the training is thorough and the same standard is rigorously maintained. The writer gives an account of a visit to an Operational Training Unit, the last stage of R.A.F. pilot training, where the crews are formed and trained for air warfare. Facilities, equipment and course of instruction are noted. *The Aeroplane*, July 11, 1941, page 38, 1 illus.

Wanted—a C.M.T.P. John R. West. An analysis of the aircraft production industry's need of supervisory, managerial and executive personnel to conduct the work of the many thousands of unskilled and semi-trained workers who have been brought into the industry for the emergency. It is pointed out that material for these directive posts must be drawn from specialized, highly trained groups.

The assembling of fabricated parts into sub-assemblies and machine operating require only brief job training. But thorough and extensive training are necessary to turn out good engineers, draftsmen, toolmakers, diemakers, inspectors and men capable of such technical and specialized duties as power plant installation, final assembly, testing and installation of instruments and hydraulic and radio equipment. The lack of comprehensive and adequate training facilities and program in this field forms the subject of the article. *Western Flying*, July 1941, pages 34, 36, 38, 5 illus.

1941 Bluebook of Aviation Schools. A special supplement to *Southern Flight* published in a separate edition to provide reliable advice and factual data for the selection of a suitable school to qualify the aeronautical student for an aviation career or factory employment. *Southern Flight*, August 1941.

Aeronautical Education in Germany. G. Doetsch and J. Seidel. A description of the elaborate government organization for students chosen by the D.V.L. An account is given of the course of study, alternative courses, workshop training and students, grants in aid, study groups and flying clubs and the recruiting of candidates. *Aircraft Engineering*, July 1941, pages 190–192.

Boebachterausbildung in der Luft (Classes for Training Airplane Observers During Actual Flight). Photographs and captions explaining the training of airplane observers of the Swiss army during flight. The interior of a Ju-52 is transformed into a classroom where a competent instructor teaches under actual flight conditions. *Schweizer Aero-Revue*, July 1941, pages 22, 23, 9 illus.

Maintenance

Diagrammatic Knowledge. "Watchkeeper." An article on the simplification of the aircraft mechanic's work suggests that unnecessary information is more harmful than helpful to him because it dilutes essential knowledge. In all aircraft there are parts that give no trouble and require no servicing. Others give no trouble and require only a minimum of attention. Yet others give no trouble if intelligently looked after. But a few require "careful nursing" if they are to function at all. These four categories provide a guide in estimating the right amount of knowledge required by the aircraft mechanic.

The memory need not be burdened with the intricacies of operation of the first class of parts. The same applies to the second group, though it may be necessary to know their servicing routine. But for satisfactory servicing, it is essential to know something about the operation of the third and fourth types of part. Two such parts —the dual relay valve in the pneumatic braking system and a particular type of motor-driven air compressor— are discussed to exemplify what must be learned by the mechanic about these two classes of aircraft part. *The Aeroplane*, July 25, 1941, page 101, 1 illus.

Spartan's Overhaul Base. Tom Neal. A description of the considerably expanded maintenance and overhaul operations of the Spartan School of Aeronautics. The increased number of Air Corps Flying Cadets being trained by private aeronautical schools under contract with the Government have brought about an increase in the amount of space, facilities and equipment required to service training airplanes. This article gives an account of the manner in which the Spartan School has met this expansion problem. *Aero Digest*, September 1941, pages 2–6, 209, 255, 10 illus.

Materials

Physical Properties and Applications of Beryllium Alloys. Louis L. Stott. A paper on the physical properties of beryllium and its use in alloys for aircraft structures, parts and instruments. Problems of refining are discussed together with past experiments in alloying it with aluminum. Present uses of beryllium in hardening copper are also described, as well as the increasing application of copper-beryllium alloys in the manufacture of aircraft instruments. *Aero Digest*, September 1941, pages 189, 190, 193, 259, 3 illus.

Mobilizing Materials for Defense. John H. Van Deventer. A paper by the president and editor of *The Iron Age* relating to the methods by which the most efficient use can be made of available materials as a means of maintaining priorities and rationing at a minimum, and controlling the flow of defense materials. The status of supply of various metals in particular is noted with suggestions as to the future position of these materials. *A.S.T.M. Bulletin*, August 1941, pages 19–24.

Metallurgy

New Heat Treatment Theory. The description of a novel circulation system in salt bath furnaces for heat treatment. The "electrothermic-Permeation" principle for increased efficiency involves the generation of heat for the bath throughout all the effective working space rather than in a confined, separate heating area. Distribution of current flow for heating the salt is by unique patented arrangement of electrodes so that the greatest heat is at the bottom of the pot, with the balance decreasing in intensity as it approaches the surface of the liquid. This principle for increased efficiency is used in the improved type of Upton furnace for any liquid heat treating operation requiring a range of temperature of from 300 to 2,500°F. *Canadian Aviation*, July 1941, pages 54, 55, 5 illus.

Heat Treatment of Aircraft Gears. John L. Buehler. An outline of the general nature of the heat treatment required for aircraft gears, this paper discusses the principles involved and the process used at the Indiana Gear Works. *Heat Treating and Forging*, July 1941, pages 348–350, 1 illus.

Military Aviation

An Appreciation of the Situation. C. G. Grey. An evaluation of the factors which have enabled the R.A.F. to successfully perform its role in defending the British Isles and to successfully combat the superior numbers of the German *Luftwaffe* in foreign areas. A personalized interpretation, the article generalizes on the nature of R.A.F. success. *The Aeroplane*, July 4, 1941, pages 9, 10.

U.S. Warplanes Abroad. Brig. Gen. Martin F. Scanlon. An account of British procurement of American aircraft during the past two years with notes on where and how they are being used in the war. When the British and French purchasing commissions came to the United States in 1938, only two aircraft types were available in large quantities—the Lockheed transport and the North American basic trainer. Several hundred of each were ordered. These airplanes, now known as the Lockheed Hudson reconnaissance bomber and the North American Harvard trainer, have played important roles in their respective fields. Types and disposition of American military aircraft delivered to Great Britain in later months are also discussed. *Flying and Popular Aviation*, September 1941, pages 134, 136, 2 illus.

Air Bases. Col. Frank M. Kennedy. Details of new air base expansion for the Army Air Forces. Included is a description of the many units that make up an air base—air fields, hangars, maintenance and repair shops, living quarters, weather stations, communications systems, aircraft warning stations, hospital and radio stations, and many other units. *Flying and Popular Aviation*, September, 1941, pages 128–130, 196, 7 illus.

Cargo and Transport. Maj. Murray C. Woodbury. The largest air freight line in the United States is operated by the Army Air Forces. This description of the Transport Squadrons, their background and present day operations and equipment. Most of the transports in use today are counterparts of the Douglas DC-2's and DC-3's used by the airlines. Aircraft engines, parts, and supplies of every description are shipped by air. *Flying and Popular Aviation*, September 1941, pages 124–127, 200, 202, 13 illus.

Maintenance Command. Brig. Gen. Henry J. F. Miller. An outline of the duties of the Air Corps Maintenance Command. It does the same job for the Army Air Forces that the Quartermaster Corps does for the Regular Army. Its functions include maintenance, supply, transport between stations, and warehousing. Details of its activities are discussed. *Flying and Popular Aviation*, September 1941, pages 120,123, 178, 10 illus.

Production Engineering. Lieut. Col. Kenneth B. Wolfe. A review of the functions of the Air Corps Production Engineering Section at Wright Field. Production Engineering draws up contracts for purchase of supplies and equipment and supplies engineering supervision of the many details of purchase, delivery, and production efficiency. *Flying and Popular Aviation*, September 1941, pages 118, 119, 200, 208, 4 illus.

U.S. Army Air Corps. Maj. Gen. George H. Brett. An outline of the functions of the Air Corps. The Combat Command does the fighting. The Air Corps supplies the men, aircraft and equipment with which to fight. Its duties include training, engineering, procurement and supply. *Flying and Popular Aviation*, September 1941, pages 67, 68, 202, 3 illus.

Compensating the compass on a Curtiss P40D on the compass rose outside the newly opened 1,500,000 sq. ft. Curtiss-Wright plant at Buffalo, N. Y.

Experimental Engineering. Lieut. Col. Franklin O. Carroll. Experimental Engineering and the Army's Wright Field are practically synonymous; hence, the major part of this article is devoted to Wright Field. Test and development activities there have for an objective and daily inspiration the aim of keeping the United States three years ahead of the rest of the world in military aircraft development. New wind tunnel equipment is briefly described, together with its use in obtaining experimental data on models. *Flying and Popular Aviation*, September 1941, pages 84–86, 208, 6 illus.

Ground crews. Maj. Joseph L. Loutzenheiser. The problem of training ground crews and personnel for the Army is reviewed. Many of the mechanics, technicians, and engineers needed in the emergency expansion program will be trained in civil contract schools, under Army supervision. *Flying and Popular Aviation*, September 1941, pages 72–74, 180, 184, 6 illus.

Pilots and Air Crews. Brig. Gen. Davenport Johnson. A general outline of Air Corps pilot training as it will exist under the new plan for training 30,000 pilots per year. Primary training will be given by 41 civilian schools, while basic and advanced training will be expanded and accelerated accordingly. *Flying and Popular Aviation*, September 1941, pages 70, 71, 140, 144, 146, 9 illus.

Reconnaissance and Observation. Lieut. Col. Howard A. Craig. An outline of the important work done by this branch of the air arm, together with brief descriptions of some of the aircraft used. Reconnaissance and observations are the eyes of the modern army. The terms both signify scouting work—the former for the aerial striking forces and the latter in behalf of ground troops. The duties, special types of airplanes and equipment of each are described. *Flying and Popular Aviation*, September 1941, pages 64–66, 206, 11 illus.

Bombardment. Lieut. Col. Harold L. George. A discussion of the development of bombardment as an air arm and the significant part it is playing in the present war. The writer believes that only the mistakes made by the German *Luftwaffe* in depending upon bomber speed for protection enabled the multi-gunned fighters of the R.A.F. to save England last fall. *Flying and Popular Aviation*, September 1941, pages 47–51, 18 illus.

Combat Command. Lieut. Gen. Delos C. Emmons. Outline of the development and organization of the

Air Force Combat Command, organized in 1935 to meet the tactical need for a mobile striking force. It came into being through the findings and recommendations of the Drum Board, composed of outstanding general officers and the Chief of Air Corps, which made its report in 1933. Problems of standardized training and present organization are discussed. *Flying and Popular Aviation*, September 1941, pages 45, 46, 188, 192, 216, 3 illus.

Materiel Division. Maj. Gen. O. P. Echols. An outline of the purposes and duties of the Air Corps' Materiel Division. This is the organization of supply for the Air Corps. General organization of the division and its many activities in research, production and supply are described. *Flying and Popular Aviation*, September 1941, pages 83, 168, 1 illus.

U.S.A. Aircraft in the R.A.F. An editorial on the excellence of design and workmanship embodied in the latest American types of aircraft introduced to R.A.F. service. In connection with the development of exhaust turbo-superchargers, it is noted that "American metallurgists have successfully mastered the problems," particularly in the matter of a bearing metal capable of withstanding the intense heat of the exhaust gases. With reference to armament and armor, it is said that huge hangar-workshops wisely dispersed throughout England attend to the self-sealing properties of tanks, increase in armor and defensive fire-power. *Aircraft Production*, August 1941, page 265.

The Grasshopper Fleet at "War." Sgt. A. A. Lawrence. The writer's observations on the operations of light airplanes during recent army maneuvers are set forth in this personalized account of the performance of these craft as liaison and observation equipment. *The Sportsman Pilot*, August 15, 1941, pages 8, 9, 46, 48, 4 illus.

Blitz Over the Pacific. Lynn C. Thomas. An account of American defenses in the Pacific and of the program now under way to fortify and improve them. Air base facilities and airplane equipment now in operation in the Philippines and Hawaii are surveyed. *Western Flying*, July 1941, pages 30–32, 5 illus.

Light Airplanes as a Cooperating Unit of the Infantry. Cy Caldwell. Discussion of a proposal by Major C. L. Adams, U.S. Army, that each infantry regiment should have as part of its equipment at least eight light airplanes, and every artillery battalion should have five. These should be flown, not by highly trained Air Corps officers, but by infantry and artillery non-commissioned officers who could be taught to fly them in a few weeks. These airplanes would be used for scouting, photography, and reconnaissance, and even take up commanding officers for a first hand look at tactical positions and terrain. It is said that they could also be used for attacking tanks and for the protection of motor convoys in emergency. *Aero Digest*, September 1941, pages 58, 60, 213–216, 4 illus.

Meteorology. Lieut. Richard Arnold, Jr. The Weather Service, U.S. Army Air Corps, is designed to increase the percentage of military missions successfully performed by keeping combat flight personnel informed and up to the minute on weather data. Its organization is outlined in this description of its operational procedure, personnel training program, and methods of gathering meteorological data. *Flying and Popular Aviation*, September 1941, pages 110–112, 4 illus.

Fleet of Flying Spiders Readied for Army. Photographs and brief descriptive captions on some of the newest types of American barrage balloons. These range from small balloons (1,500 to 2,000 cu.ft.) which can be towed behind trucks to balloons holding 68,000 cu.ft. of helium and capable of being stationed at 15,000-ft. altitudes. *Popular Science*, September 1941, pages 70, 71, 7 illus.

Photography. Lieut. Col. George W. Goddard. A review of modern methods and developments in military aerial photography. Types of equipment now used by the Air Forces are briefly described. *Flying and Popular Aviation*, September 1941, pages 98–109, 150, 152, 156, 158, 23 illus.

The German Air Force. Lieut. Col. W. Lockwood Marsh. An article by the editor of *Aircraft Engineering* analyzing the effectiveness of German airplane attacks on England. The degree of air raid damage is noted briefly. German attacks on convoys are said to have failed. Germany's bomb sight is said to be inadequate and British airplanes are held to be superior. *Indian Aviation*, March 1941, pages 58–60.

"We Encountered the Enemy." Ernest McNab. The wing-commander of Number 1 Fighter Squadron, R.C.A.F., describes the experiences of his squadron in combat. Air war tactics of both Britain and Germany are noted with observations on the organization, equipment and conduct of Britain's air forces. *Canadian Aviation*, July 1941, pages 15–17, 32, 11 illus.

Radio. Maj. George V. Holloman. Radio in military aircraft is used for both navigation and communication. Two laboratory units, air navigation and communications, handle radio development at Wright Field. Some of the current research and tests are described. *Flying and Popular Aviation*, September 1941, pages 96, 97, 210, 6 illus.

Full-Scale Offence. An analysis of the tactics and results of the heavily-increased offensive of the R.A.F. against Germany and German occupied territory, especially in face of the distraction of German air power by the war on the Russian front. R.A.F. activities in the Middle East are also reported, and an analysis of comparative air losses is given for the week of June 29 to July 5. *The Aeroplane*, July 11, 1941, pages 34, 35, 3 illus.

Dive Bombing. An analysis of factors affecting the pilot and the airplane in the act of dive bombing. A discussion of the "blacking out" of the pilot is followed by various data pertaining to the angle of attack, the pull-out and characteristics of airplane types. *Flight*, July 10, 1941, pages 20a–d, 13 illus.

The 96th Week of The War in the Air. A summary of the increased offensive undertaken by the R.A.F. in day and night assaults on Germany and German-occupied territory. Command of the air over Germany itself cannot be wrested from Germany, it is said, until Britain can escort bombers with fighters of equal range or can attack with day bombers fast enough to evade interception. Britain is now building up striking power for the air offensive of next year. For that offensive the high-flying, high-speed day bomber is called the urgent need. With advantages in both speed and height, armament is said to become secondary. *The Aeroplane*, July 11, 1941, page 33.

Naval Aviation

Truly Illustrious. An account of a seven-hour attack by Italian and German bombers on the British aircraft-carrier *Illustrious*. The torpedo-bombers having missed their mark, the enemy attacked the *Illustrious* with masses of dive bombers. The account describes the action of the anti-aircraft in thinning down the attackers, while the outnumbered airplanes from the *Illustrious* repeatedly tackled recurring formations of enemy airplanes. *Flight*, July 3, 1941, pages 6c, d, 3 illus.

Personalities

Personairlities. A sketch of the background, accomplishments and activities of Douglas Corrigan, with notes on his career as a spare parts manufacturer, barnstormer and

"wrong-way" flyer. *Aero Digest*, September 1941, pages 248, 251, 1 illus.

Franz Schneider. Note on the recent death of Franz Schneider, native of Switzerland who was "a successful airplane designer with original ideas." He was for years connected with the French firm, Nieuport. Among his outstanding patents described in the article are a number of design features. *Schweizer Aero-Revue*, July 1941, page 7, 1 illus.

Claude Ryan. A biographical sketch of the aviation career of T. Claude Ryan, airplane manufacturer and founder of Ryan School of Aeronautics. His aeronautical career has included starting the first American year-round passenger airline, building airplanes for several of the early air mail contractors, surveying the important Pacific Coast airway between San Diego and Seattle, and manufacturing the original series of Ryan monoplanes of which Lindbergh's Spirit of St. Louis was the most famous. *Western Flying*, August 1941, pages 25, 48, 1 illus.

Croil Hunter. A biographical sketch of the president of Northwest Airlines, Inc., with a note on his perspective of the company's objectives and the future of commercial aviation. *Western Flying*, July 1941, page 28, 1 illus.

Folks Worth Meeting. An outline of the route by which Vincent Bendix "arrived" in the aviation industry. A serious-minded boy of 19, bent on becoming an inventor, Bendix developed a motorcycle improvement which he sold to Glenn H. Curtiss, then motorcycle manufacturer. Several jobs in the pioneering automobile industry led him to the invention of automotive improvements, most notably the Bendix drive mechanism. Acquisition of control of some of the nation's foremost aircraft accessory manufacturing concerns paved the way to Bendix leadership today of one of the country's first 25 companies producing defense supplies. *American Aviation*, September 1, 1941, page 24, 1 illus.

From Barnstorming to Bombers. Roger Burlingame. An account of the business career of Glenn L. Martin. The writer recalls an interesting Martin prophecy made in 1914 on the military potentialities of air power. Even then he realized that bombing airplanes would change the entire aspect of modern warfare. The past few years have seen his conviction materialize. It is said that all of Martin's showmanship has been for the sole purpose of demonstrating the safety, progress and possibilities of aviation to the general public.

His career reflects his convictions about the importance of aviation to defense and more specifically the importance of fast, long-range bombers in quantity. It also shows him to be unmistakably an aircraft manufacturer, first, last and always. Putting his convictions to work in his business, he has concentrated on the development and quantity production of bombing airplanes which are among the finest and fastest in the world today. *Popular Science*, September 1941, pages 51–58, 17 illus.

Plants

New Plant for Producing Aircraft Parts. The new Poulsen & Nardon Plant at Los Angeles for the production of aircraft fittings is described in this outline of the plant equipment and layout and the parts produced. *Aero Digest*, September 1941, page 166, 4 illus.

Vega's New Plant. H. E. Ryker. The vice president in charge of manufacturing at the Vega Airplane Company describes the layout and plan of the new Vega factory, pointing out various new and unusual features incorporated into the plant in the effort to achieve maximum output per square foot of factory space. *Aviation*, September 1941, pages 65, 164, 2 illus.

Niagara Falls Plant for Assembling Bell Airacobras. Description of the new Bell plant designed for simplified and high speed production. Structure, plant layout, assembly station sequence and equipment are discussed. *Aero Digest*, September 1941, pages 62, 64, 68, 6 illus.

Curtiss-Wright's New Buffalo Plant. Detailed description of Curtiss-Wright's new fighter aircraft plant, recently completed at Buffalo, N. Y. *Aero Digest*, September 1941, pages 86, 216, 6 illus.

Ten-Fold Expansion. Sidney H. Webster. Part 1 of an article explaining how Eclipse Aviation Division of Bendix Aviation Corp. has prepared for defense by expanding its facilities. Among the aspects discussed in this installment are the leasing of additional plants, plant modernization, development of the metallurgical department, the planning for production and machine tool modernization. *Aviation*, September 1941, pages 54, 55, 166, 168, 8 illus.

Expansion Without Bricks and Mortar. Faced with the necessity for plant expansion to provide facilities for increased propeller production, the Hamilton Standard Propellers division of United Aircraft Corporation selected a deserted factory in an unspoiled community as a means for providing the most economical form of expansion. The advantages of this form of expansion are described along with details on the equipping of the plant for production. *Aviation*, September 1941, pages 62, 63, 140, 4 illus.

The New Vega Plant. Maxwell Stiles. A full account of the new $7,000,000 Vega Airplane Company plant at Burbank, California. The layout and plan of the factory together with the facilities and equipment being installed for Vega Ventura and Boeing Flying Fortress production are described. One of the features of the plant is the special arrangement for continuous flow, assemblies being made adjacent to the next point of use instead of fabricating parts and putting them in stock rooms and pulling them out to put in assemblies, then putting assemblies in stockrooms, etc. *Western Flying*, August 1941, pages 28, 29, 52, 3 illus.

Plastics

Aircraft Plywood. An abstract of the much quoted and reprinted paper presented by Thomas D. Perry before the Organic and Synthetic Materials Session of the Institute of the Aeronautical Sciences annual meeting, January 1941. The paper treats of improvements resulting from the use of modern phenolic resin adhesives and molding processes currently practiced in the fabrication of aircraft units. *Aircraft Production*, June 1941, pages 221–223, 7 illus.

Phenolic Resins for Plywood. Louis Klein. The historical development of phenolic resins for use in plywood is traced for the period from 1900 to the present day in this article. The various physical forms in which resin has been used as a plywood adhesive are described—*i.e.*, as a powder, in organic and aqueous solution, as a dispersion, and finally in film form.

New products, water-soluble phenolic powders of good stability and rapid curing properties, are discussed. Development work covering the use of phenolic resins as impregnants to produce products such as improved wood and wood with better dimensional stability are covered. The fields of application for resin-bonded plywood with special emphasis to aircraft construction are touched briefly. *Industrial and Engineering Chemistry*, August 1941, pages 975–980, 4 illus., bibliog.

Plastic Components for Aircraft. Notes on recent developments in American molded forms. One consists of plastic tabs varying in size and detail and designed for different air-

craft. They are for use on ailerons, elevators and rudders in place of metal or fabric parts and combine properties of lightness and strength. Another plastic unit described is the plastic instrument panel unit used on the Aeronca airplane. *Aircraft Production*, June 1941, page 192, 1 illus.

Private Flying

Lightplane Flight to San Jose, Costa Rica. Leroy Wesley Powell. Noting the lack of highways in Latin America, the writer expands on his contention that to enjoy traveling in that part of the world one must take to the air. An account is given of a flight made from Paitilla Field, Panama, to San Jose, Costa Rica, and return. Flying conditions and course for the trip are described. *The Sportsman Pilot*, August 15, 1941, pages 10, 11, 44, 45, 2 illus.

A Salesman Recommends. Peter Volid. A travelling salesman, now partner in a business of his own, outlines his experiences with the use of a private airplane as means of transportation on his business trips. Convinced of the superior advantages afforded by an airplane for sales trips for a long time before it became possible to test the idea, the writer shows how thoroughly his 80 hp. Stinson has lived up to his expectations in this respect. *The Sportsman Pilot*, August 15, 1941, pages 28, 30, 1 illus.

Production

Unit Assembly at Floor Level. A brief account of a German method adopted in the Junkers works for unit assembly of airplanes at floor level. Normally the larger components of aircraft are supported on scaffolding and staging and take up a great deal of floor space besides necessitating elevated working positions. In the Junkers plan, the landing wheels are mounted at an early stage and in their unretracted position support the complete wing during the fitting of wiring, de-icing installation and engine mounting.

Pits or runways are cut into the floors of the factory along which the wheels run, and at such height as to permit necessary operations more conveniently from ground level. Other mechanics stand in the pits to effect work on the underside of the nacelles. Safety chains carried on metal posts are arranged alongside the pits to prevent men accidentally falling in. *Aircraft Production*, August 1941, page 272, 1 illus.

Flush Riveting. The details of Douglas Aircraft Company's new system for flush riveting are presented in this discussion of the problems encountered in flush-riveting thin-gage light alloy sheets. *Aircraft Production*, August 1941, page 272.

Explosive Rivets. Norman J. Clark. A note on production uses of the explosive rivet, with suggestions for extended application of this new development. *Western Flying*, August 1941, pages 33, 34, 1 illus.

Supercharger Air Intakes. Describing the production of units in sheet metal for the Rolls-Royce Merlin engine, it is noted that usually, for economy in both weight and cost, a fabricated part gives place to a casting or forging for quantity production. However, supercharger air intake manufactured by Park Ward and Co., Ltd., represent the opposite development.

Replacement of an aluminum casting by sheet metal has resulted in appreciable weight-saving and its less rigid form of construction minimizes damage to the engine resulting from forced landings of the aircraft with wheels up. This article gives an account of the progressive methods and operations used by Park Ward in the construction of the air intake from sheet metal. *Aircraft Production*, August 1941, pages 269–271, 9 illus.

Plowshares Into Swords. A description of the conversion of the Cockshutt Plow Company's plant from the manufacture of agricultural implements to the manufacture of aircraft parts. Problems encountered in converting machinery, equipment, and production methods and flow are outlined. *Commercial Aviation*, July 1941, pages 65–67, 8 illus.

New Process Turns Out Work Templates in Five Minutes. Description of the electrolytic transfer process used for reproducing work templates at the Lockheed Aircraft Corporation laboratories. The three steps in the process are: the preparation of the original drawing by an engineer; the scribing of the drawing on a specially-treated metal sheet to make the master layout; and the transfer of the scribed layout (with all the detailed information noted on it) to an inexpensive metal copy sheet from which the work template is cut. *Commercial Aviation*, July 1941, pages 72, 74, 3 illus.

Menasco Builds Engines for Canada Struts for British Pursuits. An account of the current production program of the Menasco Manufacturing Company. The development program is also noted along with major changes in the design of Menasco engines. *Commercial Aviation*, July 1941, pages 68, 71, 76, 10 illus.

Aircraft Inspectors. A description of the special as well as routine duties of the aircraft inspector in the manufacturing plant from the point of view of what it takes to make "one of the unsung heroes of industry." *Commercial Aviation*, July 1941, pages 28, 29, 4 illus.

Aircraft Production Heads for the Blue. Notes on the progress in production of airplanes and engines for Britain. Production is said to be rising steadily. Full schedule engine production is yet to be reached, but output generally is said to have exceeded plans. *Canadian Aviation*, July 1941, pages 18, 19, 32, 4 illus.

The Jigging of Modern Airframes. IV. The concluding installment in a series of articles which review some of the methods used by British and foreign manufacturers for jigging modern airframes. This portion deals with components and sub-assemblies. *Aircraft Engineering*, July 1941, pages 195–204, 58 illus.

We Learned This in Europe. A. Leliwa-Krzywoblocki. The writer, well-known in Europe as a writer on aircraft production, has held important production jobs in Polish and French aircraft plants. In this article he points out some of the lessons learned in Poland and France regarding production under wartime conditions and suggests their application to aircraft production programs in England and Canada. *Canadian Aviation*, July 1941, pages 37, 38, 55, 2 illus.

Mechanized Plane Assembly. An account of the conveyor system installed by Vultee Aircraft, Inc., and the manner in which it has accomplished a four-fold production increase in the Vultee plant. *Canadian Aviation*, July 1941, pages 46, 48, 3 illus. Also, *Commercial Aviation*, July 1941, pages 75, 76, 2 illus.

New Light on Production Problems. Charles F. McReynolds. The search for an ideal system of artificial illumination at the new Vega Airplane Company plant at Burbank has resulted in the world's largest single installation of fluorescent lights in a plant which is 100 per cent fluorescent lighted, according to this article which describes the lighting system and the manner in which it is designed to meet the specific needs of this particular plant. *Aviation*, September 1941, pages 64, 168, 2 illus.

Airplane Specification Engineering. Peter A. Beck and Richard H. Robb. A description of the functions, organi-

zation and operations of the specification staff at Lockheed Aircraft Corp. Also outlined are the procedures carried out in executing the various phases incident to the negotiation and completion of contracts for airplane production. *Aviation*, September 1941, pages 56, 57, 182, 184, 4 illus.

Using Cameras as Aircraft Production Tools. Joseph H. Washburn. A review of photographic methods of making duplicate templates, or work patterns and for producing blue prints from photo-tracings. Equipment and procedure for both operations are described in detail. *Aero Digest*, September 1941, pages 178, 181, 182, 252, 12 illus.

Mathematical Accuracy From Small Scale Layouts. Lyle L. Farver. Description of a method for obtaining fairing lines of great accuracy, and a simplified dimensioning of long smooth curves for the shop. The method gives accurate offsets at all stations besides the slope to the line tangent to the curve at any point. *Aero Digest*, September 1941, pages 153, 255, 256, 3 illus.

Sheet Metal Drafting. Part 2. Surface Development. Charles Belsky. Description of methods for increasing the volume of a surface for reasons of clearance, styling, passenger seating and streamlining. A series of sections parallel to a given section is drawn approximately to the required outlines, and the sections are cross-checked to establish their accuracy and to determine whether they will produce a flowing surface. Various problems in surface development are shown and discussed. *Aero Digest*, September 1941, pages 145, 146, 149, 150, 5 illus.

British Tube and Section Forming. D. J. G. Rowe. The bending of thin-walled metal tubing accurately to given radii was formerly an uncertain process, often yielding varying results. The use of Cerrobend, an alloy of bismuth, lead, tin and cadmium, has been found to make an ideal filler for tube bending, according to the writer. The preparation of Cerrobend as a filler and its application to the tube-bending process are described along with the properties and characteristics of the material. It is said that this method yields results as precise as any other task in aircraft production requiring close tolerances. *Aviation*, September 1941, pages 74, 75, 174, 8 illus.

New Reproduction Process at Republic. Bruno M. Smiling and Ben Rudnick. A description of a reproduction process developed by Republic Aviation Corporation to eliminate the necessity of camera and lens as undesirable for use by workmen unskilled in the reproductive arts. The method adopted is of the contact type.

The material on the loft floor is given a luminescent coating, then a masking coat. Stylus-like tools are then used by the draftsmen, layout men or loftsmen to cut through the masking coat and expose the luminescent coat underneath. The preparation of the reproduction sheet and the method of exposure are explained. *Aviation*, September 1941, pages 77, 172, 2 illus.

Rubber Die Pressing. An account of the development and application of the rubber die pressing process in the United States. The article describes the equipment required for this type of pressing, the economies effected by using this process and the methods for the hot-forming or blanking of magnesium alloy sheet. *Aircraft Production*, June 1941, pages 213–215, 6 illus.

Bombers by Martin. A series of informative illustrations and captions depicting various steps in the fabrication and assembly of the Martin Maryland bomber at the plant of The Glenn L. Martin Company. *Air Trails*, August 1941, pages 10–13, 26 illus.

Industry Progress—Second Quarter, 1941. A review of production, expansion, payrolls and of general progress in the American aviation industry during the April–July period. Some statistics are given and a directory of American-built military airplanes for the R.A.F. is included. *Aircraft Record*, August 1941, pages 1–12.

Die-Cast Components. Highly-stressed aircraft components, the manufacture of which formerly required expensive built-up constructions, can now be produced practically in a single operation as aluminum-alloy gravity die-castings. Illustrating the efficiency of this method, this brief article notes the comparative properties of a component so made—a control member. *Aircraft Production*, August 1941, page 301, 2 illus.

The Lockheed Aircraft Plant. H. W. Perry. Following the *Aircraft Production* series reviewing the activities of large American aircraft factories, this article provides a survey of production methods employed at the Lockheed factory in the cutting and shaping of sheet metal and the progressive fabrication of Lockheed aircraft. The company's expansion has brought into use much of the modern equipment normal to present trends in America, such as the use of soft metal dies, spot welding, multi-tool routing boards and rubber dies. Also being pressed into service are certain developments resulting solely from the research of the company's own engineers. This account is presented particularly with these developments in mind. *Aircraft Production*, August 1941, pages 285–289, 18 illus.

Propellers

Hydromatic Airscrews. Part I. The first of two articles clarifying the highly specialized aspects of this branch of the aviation industry, which requires extreme accuracy, the employment of high tensile steels and intricate shapes in many of the components. The present discussion outlines the design and main operating features of the latest Hamilton constant speed propeller manufactured in the de Havilland works. Production data are presented referring to the inner cam, hub casing and blade gear segment. *Aircraft Production*, August 1941, pages 273–280, 31 illus.

Airscrew Weight—I and II. K. G. Gillmore and A. V. Cleaver. A discussion of theories regarding propeller weight in relation to engine power. The present trend toward very high-powered motors is said to have caused much concern due to a quantity of published literature which purports to prove that a propeller will inevitably increase in weight with increased engine power. The theory is analyzed and its supporting arguments are likened by the writers to the square-cube law often forwarded as proof that practical very large aircraft could not be built.

In a mathematical and practical discussion of the results of detailed experience with practical propeller design, the writers analyze the analogy to show that it is very close but that, just as practical considerations intervene to disprove the aircraft square-cube law, so also the propeller argument is largely nullified. *The Aeroplane*, July 18, 1941, pages 70–72, 5 illus.; July 25, 1941, pages 105, 106, 5 illus.

Four-Blade Propeller by Rotol. A description of the new variable pitch design introduced by Rotol Airscrews of England. *Canadian Aviation*, July 1941, page 22, 1 illus.

Testing

Service Test—Rush! Douglas Ingells. Stressing the dependence of air strength upon quality and constant improvement, this article outlines the testing job being done by the Army Air Corps' Materiel Division at Wright Field, Dayton. The work of both proving and improving new airplanes, parts, accessories and equipment has had to be accelerated to

keep pace with the nation's program for attaining air power. The two or three-year experimental stage needed to develop a new airplane from blueprint to flight service has been cut to 18 months.

This account describes the Materiel Division's accomplishment of a "year's worth" of test flying in 150 hours without loss of dependable, effective results. Illustrations include a number of the newest American airplanes being tested at Wright Field. *Air Trails*, August 1941, pages 16–19, 33, 20 illus.

Straws in the Wind. Douglas J. Ingells. A description of the nature, function and importance of wind tunnels and wind tunnel aircraft models in the development and testing of airplane types. A practical explanation of how wind tunnels and models provide the essential background knowledge and information from which safer, more efficient aircraft emanate. *Air Trails*, August 1941, pages 24, 25, 36, 37, 7 illus.

Vibration Measurements. C. S. Draper. An outline of modern methods of measuring vibration in aircraft. Various problems and measuring equipment are described together with types and patterns of vibration encountered. *Aero Digest*, September 1941, pages 136, 138, 140, 142, 256, 259, 7 illus.

Flying Test Stand. Herb Shebat. Discussing the various factors involved in securing flight test and test stand data on airplane engine installations, this article points out that new instruments and methods in flight testing aircraft engines constitute a laboratory aloft. Since the ultimate object of engine construction is to build engines which perform well in flight, the test stand is an intermediate step and most valuable, therefore, when the data it produces are applicable to flight conditions. *Aviation*, September 1941, pages 69, 176, 178, 180, 1 illus.

All-Metal Wing Structures. An explanation of the system developed at Consolidated Aircraft Corporation for hydraulically testing wings. The method eliminates complicated scaffolding and the thousands of sandbags or shot required by the conventional form of wing testing, which was "very satisfactory for proof loadings" but required far more time and personnel.

The several requirements of the hydraulic test which eliminate this complication are noted in the description of how air loads are simulated and wing deflections indicated by the new test method. *Aircraft Production*, June 1941, pages 191, 192, 3 illus.

Testing Propellers for Wear and Balance. An account of the devices and methods for testing propellers under the most rigorous conditions as done at the new Hamilton Standard Propeller Division's laboratory. *Commercial Aviation*, July 1941, pages 73, 74, 2 illus.

Tools and Equipment

Surface Analysis. The Brush S.A.I. surface analyzer, a new British product, is claimed to be capable of recording surface irregularities of one millionth of an inch or less. It comprises three principal units, an analyzing head, calibrating amplifier and direct-inking oscillograph. The units work jointly, providing an instantaneous and permanent record of the surface. Magnifications up to 100,000 are attainable. Absolute measurements are shown without need for conversion formulas and values in fractions of micro-inches may easily be determined. Each of the three units is described. *Aircraft Production*, June 1941, page 203, 2 illus.

Modern Machine Tools. Detailed descriptions of recent additions to the range of factory plant equipment in Britain. Among these are an improved automatic turret lathe for chucking; a heavy-duty sliding, surfacing and screw-cutting lathe; a bench lathe to supplant the Boley and Leinen bench lathe which is no longer obtainable; a second-operation lathe for de-burring, chamfering, facing, polishing and such work; a self-contained bench milling machine and a substantially improved type of tapping machine. *Aircraft Production*, June 1941, pages 204–206, 9 illus.

Photographic Storage. The Barcro system and apparatus for duplicating drawings and simplifying office procedure are described in this account of a photographic method of dealing with drawing and document storage and duplicating needs. *Aircraft Production*, June 1941, pages 207, 208, 3 illus.

Shop Equipment and Small Tools. Presenting a number of small tools for aiding efficient production, this article describes the characteristics and applications of a new nibbling shear, a portable projector, an indicator for hardness testing, a new range of duralumin forging furnaces, magnetic filters for the purification of machine oil and a portable fluorescent lighting unit. *Aircraft Production*, June 1941, pages 216, 217, 6 illus.

Aircraft Production Training Course. The first of a series of informative articles designed to cover the entire field of aircraft production. This installment deals with cutting tools in aircraft plants. Cutter sharpening, the selection of cutters and their uses are considered. *Canadian Aviation*, July 1941, pages 40, 43, 44, 25 illus.

Mobile Assembly Equipment. A description of the new cradle technique for decentralized manufacture of aircraft components. The system is intended to replace the usual practice of building up each component on a special assembly fixture and then transferring it to a stand where the installation of wiring, hydraulic systems and equipment is completed. The Esavian cradle system, developed by E.S.A., Ltd., in England, replaces such stands, forming a rigid yet mobile platform upon which assembly of the component can be completed and upon which subsequently it can be transported.

Location on the cradle is taken from the basic structure of the unit in such a way as to leave free the joints by which it is assembled to the rest of the aircraft. The sequence of assembly operations on a hypothetical heavy-bomber type of aircraft is illustrated in a series of line drawings, and the method for fitting the undercarriage is described. The advantages and adaptability of the system are pointed out. It is now being used in England for the production of several types of aircraft, including both heavy bombers and fighters. *Aircraft Production*, August 1941, pages 267, 268, 7 illus.

A Six-Station Rubber Press. A description of the new Bliss six-sided hydraulic press for the high speed production of parts by the rubber die process. The press, built for Douglas Aircraft Company is of 2,500-ton capacity, weighs approximately 150 tons and occupies a circular floor area about 32 ft. in diameter. The operational advantages of the press and its improvements over earlier four-sided presses are emphasized. *Aircraft Production*, August 1941, page 283, 1 illus.

Photographic Reproduction. Presenting the details of the Technaphot industrial camera and photographic equipment, this article describes the reflex system of contact printing from opaque originals. This method permits the multiplication of copies from drawings on cardboard or from matter printed on both sides of the paper. The process and equipment are described. *Aircraft Production*, August 1941, page 284, 3 illus.

Modern Machine Tools. Presenting some new types of machine tools for sawing, capstan lathe work, vertical milling, band sawing and filing, wood sawing, milling and turning, this regular section describes their design, operation and uses. *Aircraft Production*, August 1941, pages 290–292, 8 illus.

A New Spot Welder. An explanation of the design and functioning of the Taylor-Winfield spotwelding machine for aluminum alloy sheets. *Aircraft Production*, August 1941, page 295, 2 illus.

Shop Equipment and Small Tools. This regular presentation of recently developed aids to efficient production reports in this installment on new jacking equipment, clothes storage, a salt bath furnace, raid shelters, the conversion of lathes, fireproof partitioning, new midget drills and pop-riveting pliers. *Aircraft Production*, August 1941, pages 299, 300, 7 illus.

Welding

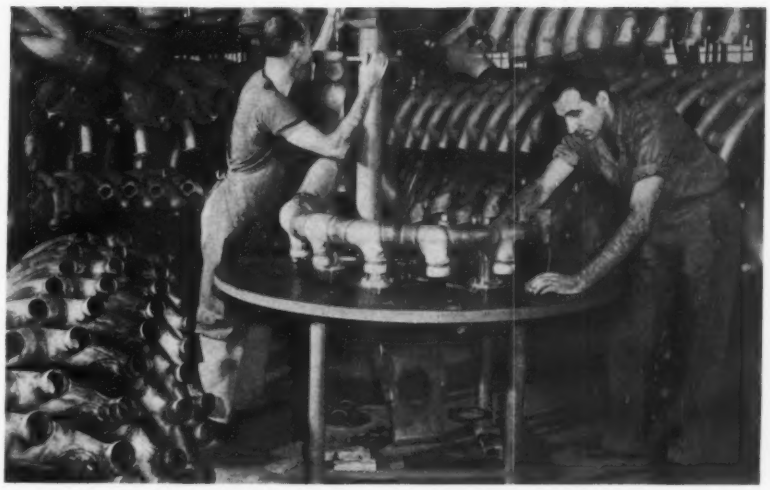
Spot Welding. Notes on the research and experimental work of Bell Aircraft Corporation's welding research department. Its findings with regard to the spot welding of alloys of light aluminum and magnesium are summarized, giving data on welding procedure and weld timing. *Aircraft Production*, June 1941, page 218, 1 illus.

Arc Welding of Chrome Molybdenum Sheet and Tube. F. Robert Kostoch. Digest of a paper presented at the Western Metals Congress in Los Angeles, on the development of arc welding modern airframes. Problems of current supply, the welding characteristics of chrome-molybdenum sheet and tube and the arc welding technique used are discussed. *Aero Digest*, September 1941, pages 173, 174, 177, 8 illus.

Miscellaneous

CAA and the Airplane Buyer. Donald R. Moulton. An account of the work of C.A.A. factory inspectors, this article describes the routine as well as special duties of the inspector to show how the buyer can be assured of a better airplane as a result of the C.A.A. inspection. *Aviation*, September 1941, pages 89, 186, 8 illus.

Salute to Curtiss-Wright. A special Sunday newspaper supplement commemorating the recent dedication of the new Curtiss-Wright Corporation Airplane Division plant at Buffalo. Many articles are devoted to various aspects of the company's history and growth from a development and design as well as a business viewpoint. Other features describe the facilities and equipment at the new plant, the men and machines that build the airplanes and various steps in the process of production. A number of items pertain to Curtiss-Wright production, the personalities behind it and the company's place in the National Defense program. *Buffalo Courier Express*, Curtiss-Wright Section, August 10, 1941, pages 1–56.



Assembling exhaust manifolds for military aircraft in the specialized production line at the Ryan Aeronautical Company's factory at San Diego.

Aviation's Accelerated Production. Selig Altschul. An analysis of production increases as reflected in the semi-annual reports for 1941 released by leading aircraft manufacturers. The writer indicates that the ability to produce aircraft in volume is the key to profitable operations in the aircraft industry.

Future capital requirements necessitate a constructive economic regulatory policy for the continued growth of the air transport industry. Much uncertainty has been caused, it is said, by government regulations and the threats of dislocation concomitant with the confusing reports and decisions of the C.A.B. It is suggested that an official C.A.B. formula for a sound constructive mail rate base will dispel these uncertainties. *Aviation*, September 1941, pages 96, 144.

On Organization. Lieut. Col. E. G. Hart. An interesting summary of the principles of organization, written by an R.A.F. officer and providing a thoroughly practical, reasoned approach to the organization of anything from a flight squadron to a business project or one's personal life on a sound, efficient and well-ordered basis. *The Royal Air Force Quarterly*, June 1941, pages 253–264.

Spanish for the Air Corps. An outline of the Army Air Corps' program for the study of the Spanish language by all its officers as a move to render more efficient and more effective cooperation with Latin American nations on matters of military and air defense in the Western Hemisphere. *Western Flying*, July 1941, page 33, 1 illus.

The Havocs Are Coming. Account of a visit to an American aircraft receiving station. The types and makes of airplanes seen are noted with descriptions as to their characteristics and destined service. *Flight*, July 10, 1941, pages 22, 23, 3 illus.

Young America Stages Its National Air Races. Albert L. Lewis. A report of the activities of the Academy of Model Aeronautics' 14th National Model Airplane Championships held at Chicago in July. *National Aeronautics*, August 1941, pages 14, 15, 5 illus.

Aero Medical. Maj. Otis O. Benson, Jr. Description of the Aero Medical Laboratory and the medical research and test work being carried on at Wright Field. Investigations of the effects of altitude, extreme speed, lack of oxygen, centrifugal force and intense cold enable Army flight surgeons to keep combat flight personnel fit to fly and fight under the extreme conditions of modern air warfare. Present experiments are directed chiefly to the protection of air crews against lack of oxygen, aero-embolism and paralyzing cold. Test equipment is also shown and described. *Flying and Popular Aviation*, September 1941, pages 88–90, 216, 7 illus.

Air Forces Publicity. Lieut. Col. Arthur I. Ennis. An outline of the organization and functions of the Air Forces Public Relations Section. *Flying and Popular Aviation*, September 1941, pages 138, 206, 214, 7 illus.

Government Publications

Civil Aeronautics Administration

Method for Stopping Small Aircraft Engines Suggested. A method is presented for stopping light airplane engines equipped with dual ignition in a manner which would eliminate backfiring. It has been suggested by a number of C.P.T.P. operators.

The procedure is to train the students to use brakes as little as possible, switching ignition from one magneto to the other while taxiing in after landing. This seems to overcome the tendency for one set of plugs to become incandescent, thereby causing pre-ignition when the switch is turned off.

Upon reaching the flight line, the engine should be run for a short while on the set of plugs which have been off last, thus reducing the temperature of the hottest set before the engine is turned off. *Civil Aeronautics Journal*, August 1941, page 192.

Parachute Inspection Problem Grows. Accelerated aging of parachute equipment has resulted from the increased use of parachutes in the Civilian Pilot Training Program and similar activities. Their use has increased from four to as many as ten hours a day. Trouble now comes to light in a few months, whereas formerly it appeared only after a year or two of ordinary service.

In order to aid in determining the airworthiness of parachutes subjected to this accelerated aging, the C.A.A. offers a series of don'ts to act as a suitable yardstick for decisions. These warn against improper testing, snap judgment condemnation, makeshift harnesses and ill-advised interchange of parts. *Civil Aeronautics Journal*, August 1941, page 192.

C.A.A. for Defense. A staff handbook, issued under the direction of Brig. Gen. Donald H. Connolly administrator of the Civil Aeronautics Administration, to acquaint the 5,500 members of the C.A.A. staff with the magnitude and importance which the present emergency has given the C.A.A.'s work.

Its defense activities are described in connection with the Civilian Pilot Training Program, the building and improvement of defense airports, the expansion and improvement of the civil airways and the removal of dangers as far as possible from all-out air defense operations. Particular emphasis is placed upon the benefit to be derived by civil aviation from these defense activities after the emergency is past. *Department of Commerce, Civil Aeronautics Administration*, September 1, 1941, pages 1–16.

Airplane Airworthiness. A revised edition of Part 04 of the Civil Air Regulations covering airworthiness requirements to be used as a basis for obtaining approved type certificates for aircraft and power plants. This supplement carries the revisions and amendments made up to April 1, 1941. Obtainable through the Superintendent of Documents, Washington, D. C., price $0.15.

Report to the Civil Aeronautics Board of a Study of Proposed Aviation Liability Legislation. E. C. Sweeney. Liability in aircraft accidents and recommendations regarding compulsory liability insurance for all types and classes of airplanes form the subject of this 520-page report released by the *Civil Aeronautics Board* for general comment and discussion.

Included in the report are interesting figures on the safety record of civil aviation, showing that airlines exceeded bus transportation in 1933 and railroad transportation in 1938 in safety figures based upon the number of passenger miles operated. On this basis, airlines were 1.7 times safer than railroads in 1938 and 5 times safer in 1939. The report also shows that the safety record of scheduled air transportation is improving at a far greater rate than other forms of transportation.

The report discusses the present law of aircraft liability compared with the law applicable to other forms of transportation, aviation liability insurance, problems of constitutionality of legislative proposals, issues and problems involved in compulsory liability insurance.

Maintenance Manual. A revised edition of the standard C.A.A. manual on the maintenance, repair and alteration of certified aircraft, engines, propellers, instruments and accessories containing amendments made up to June 1. This publication, obtainable through the office of the Civil Aeronautics Administrator, is known as Civil Aeronautics Manual 18.

U.S. Army

The New Army of the United States. In order to acquaint the American public with the progress which has been made in building the skeletonized peacetime Army into a full fighting force for National Defense, the War Department has issued a report on the state of the Army as of August first.

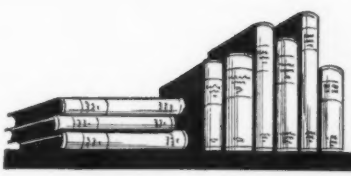
The report explains the functions of Congress, the office of the Secretary of War, the General Staff and the Joint Agencies of the Army and Navy in National Defense. The history, structure and function of the Regular Army, National Guard and Organized Reserve Corps are outlined. The background and operation of the Selective Service System and its relation to the growth of the Army are also given.

The greatest part of the report is devoted to a description of the Arms and Services of the Army. Among these, the recently autonomized U.S. Army Air Forces are presented with their new structure under the Deputy Chief of Staff for Air, who is also Chief of the Army Air Forces. The units of the air corps, their structure and function are explained with their relation to the rest of the air corps and to the military problem as a whole. *The War Department.*

Landing Mats. A report on the progress in development of portable mats to permit the use of all sorts of unprepared fields as landing areas within the theater of military operation. The Air Force's Corps of Engineers has been conducting this work since 1939.

According to the report, camouflage as well as utility is of prime importance. After considerable study and test, three general types of material were found to be generally suitable.

(Continued on page 45)



BOOKS

Template Making

The rapid expansion of the aircraft industry, accompanied by an equally rapid development in the size, performance and complexity of aircraft produced, has resulted in a tremendous increase in the use of templates and the need for template makers. With the growth of mass production of aircraft, templates have become an essential aid to insuring the interchangeability of components and the cutting of production costs.

Aircraft Template Development, a valuable manual on the technique of making modern aircraft templates, was compiled, according to its editors, as a textual aid to students, trainees and apprentices in aircraft plants to develop a knowledge of the subject in the shortest possible time. It is believed that combined with proper classroom instruction, supervision and practical shop experience it will enable the serious student to become a competent template maker with a minimum amount of further guidance.

Templates are today used almost universally throughout the aircraft industry and have contributed to the change over to the system of mass airplane production. Fabrication sequences and information given the shop in template form greatly facilitate the processes of manufacture. The layout of flat pattern of sheet metal parts, radial drilling, checking of concave and convex contours, router patterns, trimming parts and checking angles are all accomplished with the aid of templates. The problem of duplicating templates has been met by the photographic method through photoprinting on metal from the original drawings, which can thus be retained intact for future reference.

This presentation of the principles of template making treats of templates and their uses, aircraft factory terminology and subjects relative to templating, tools and equipment used, elementary and engineering drafting, flat pattern development and photographic reproduction of templates. A third of the book is given to a series of blueprints of aircraft parts, each of which is a problem in pattern development. The entire work is marked by clarity and simplicity. It will serve as a substantial basic text.

Aircraft Template Development; compiled and edited by Aero Publishers, Inc., Glendale, California, 1941; 312 pages, $4.00.

Books reviewed in this section may be purchased, or borrowed without charge, from The Paul Kollsman Library, Institute of the Aeronautical Sciences, 1505 RCA Building West, Rockefeller Center, New York, N. Y.

One View of Bomber Defense

At a time when there is so much evasive discussion about the war it is refreshing to read the views of a radical in aeronautics, one whose views are almost fanatical. "P.B.", as Pemberton Billing is known by all old timers in English aeronautics, made some of the earliest aircraft in England, founded the great Supermarine Aircraft works and organized the first bombing raids into Germany during the first World War. His criticism of the aircraft used by pilots on the front when he was a member of Parliament was the spark which set off the investigations resulting in the formation of the British Air Ministry.

In his new book he asserts, "If the alternative to ruthlessness is defeat, may we start to be ruthless, and if so, when?" He believes that all-out bombing of Germany is the only way to win the war and proceeds to describe his view of how to accomplish this. His "slip wing" airplane is nothing more than a large low-wing loaded airplane which takes off and climbs with a fast fighter attached to its under carriage. As the power is from the top airplane the fuel of the fighter is not used until it is detached for combat. His other idea, is the "tow fighter." He proposes that a large towing airplane, such as a Wellington, tow several fast fighters to high altitudes; when the enemy airplanes are sighted the fighters could be released and ready for combat with full fuel tanks.

He is opposed to the use of anti-aircraft guns as he believes they are more harmful to the defenders than the enemy. He believes that searchlights only disclose the location of strategic locations. He would place lights all over the countryside to confuse the enemy. He pleads for underground aircraft factories and aircraft hangars and urges that more attention be given to possible high altitude aircraft development by the Germans.

The book is challenging in its assertions, will cause discussion and is interesting by reason of its fearless presentation. C. G. Grey writes a witty foreword and gives a sketch of P. B.'s early career in aeronautics.

Defence Against the Night Bomber, by Noel Pemberton-Billing; Robert Hale Limited, London, 1941; 191 pages, 2*s.* 6*d.*

Fundamentals of Aerodynamics

Any subject is half learned if one has learned the reason that lies behind it. If one knows the why of airplane performance it is far easier to figure with reasonable accuracy what it will do under a given set of conditions. Such knowledge is an important part of the cautious pilot's reserve of pilot education which is an all important factor of safety in his over-all experience.

Aerodynamics is a vast subject which is growing daily. In thirty-five years it rose from guesswork to mathematical complexity. Many volumes are needed to contain the tremendous amount of research and factual material on it and twice as many to offer the conclusions and opinions of its respected experts. Nevertheless its fundamentals can be readily grasped by the student pilot, with the aid of simplified and clearly written texts, many of which have been published in the past few years.

An example of such a work in aerodynamics for the beginner is *Elementary Aerodynamics* by D. C. M. Hume, written, according to the author, for the purpose of giving students a working knowledge of aerodynamics. The book opens with chapters on the air, its measurements and characteristics, air forces, air flow, and aerodynamic forces. There are chapters on lift, stability, control and control surfaces, maneuvers, and also propulsion and performance.

The book is well designed in its text sequence and treatment. At the end of each chapter is a page or two outline or digest of the chapter which will be found valuable not only for purposes of review, but also in giving the average student a better idea of how to keep a well-designed class notebook in ground study.

Elementary Aerodynamics, by D. C. M. Hume; Pitman Publishing Corporation, New York, 1941; 136 pages, $1.50.

Astro-Navigation for R.A.F.

The Observer's Book series affords a three-volume text on celestial navigation as part of the sequence of pocket-size books for R.A.F. observers. Part 1 (volume 1) treats of celestial coordinates, lines of position, time and the spherical triangle as well as the use of the British Air Almanac and navigation tables.

Part 2 offers a discussion of the use of the sextant and methods of observing. Several chapters are given to a comprehensive description of the Mark IX averaging sextant. Corrections to the sextant reading are explained and practical examples of observations are provided.

The Observer's Book on Astro-Navigation, by Francis Chichester; George Allen & Unwin Ltd., London, 1941; Part 1, 103 pages, 2*s*. 6*d*.; Part 2, 83 pages, 2*s*. 6*d*.

Modern Aircraft Instruments

The need for a complete, modern text on modern aircraft instruments is more than satisfactorily met by G. E. Irvin's new book *Aircraft Instruments*. Written for technical high schools, aircraft schools, operators, aircraft manufacturers, and for class study wherever an aircraft instrument course is given, it offers the technical and non-technical student fundamentals of design, operation, installation, maintenance, and repair of instruments used in modern aircraft. Moreover it is completely up-to-date with clear, descriptive and illustrative material on installations, test and shop equipment, and systems of maintenance.

The book is made up of twenty chapters; six of them covering engine instruments, including pressure gages, thermometers, manifold pressure gages, tachometers and synchronizers, fuel quantity, and remote indicating systems. Six chapters are devoted to flight instruments, including air-speed indicators, rate-of-climb indicators, altimeters, the Pioneer Turn and Bank Indicator, the Sperry Artificial Horizon, and the Sperry Gyro Pilot. In three chapters on navigation instruments, card, aperiodic and remote-indicating compasses are described, together with the Sperry Directional Gyro, and the Pioneer octant. There are also chapters on meteorological instruments, instrument panel design, antivibration mounting of airplane instruments, vacuum pumps, and the installation of aircraft tubing.

Requirements for a thorough practical understanding of modern instruments are constantly emphasized. Involved technical discussion is avoided whenever possible, and treatment has been held to simple and clear terminology.

While some explanations are quite detailed, the author states in the preface that it is because he has found by practical experience in teaching the subject that such topics require longer treatment for proper understanding by the novice, also that subject sequence has been governed by the purpose of introducing the study to the reader in the most logical and interesting manner. The work is extremely well illustrated with many authenticated photographs, drawings and diagrams furnished by the principal instrument manufacturers. Also included are many useful tables and a subject index for easy reference. The book is recommended as a basic text for general courses of study in aircraft instruments.

Aircraft Instruments, by George Ellis Irvin; McGraw-Hill Book Company, Inc., New York, 1941; 506 pages, $5.00.

Rescue Work in London

John Strachey, well-known author in other fields, writes of experiences of an air raid warden in London. It is not a record of heroic deeds or thrilling escapes but of the prosaic work that so many English men and women are doing. As the title of the book would indicate, it has a gruesome side but it will give to the reader a close-up of life under air raid conditions.

Digging for Mrs. Miller, by John Strachey; Random House, New York, 1941, 150 pages, $1.25.

Civil Air Defense

The major problem in defending modern cities against the effect of high explosives, poison gases, incendiary devices and fifth columnists is to make the civil population understand the nature of the attack and their part in repelling it. According to the author of this book, totalitarian war differs completely from all previous combat in that its ultimate objective is the complete annihilation not only of the armed forces, but also of the civil population of opposing nations.

This study was written as a contribution to the civil defense of the United States under a grant from the Emergency Committee to Aid Displaced Foreign Medical Scientists. The author, well-known during the last war and the post-war period as an authority on chemical warfare, was chiefly responsible for the structure of the Civil Air Defense plan operating in Soviet Russia at the present time.

In explaining the theory and practice of modern air attacks, he makes much of the bacteriological phase. Many authorities tend to gloss over this method of destruction, claiming it to be impractical, but it is pointed out in this work that when communities are at war a great part of their medical equipment and skill is turned over to military use, and civil health may be neglected. The psychological phases of defense also are too frequently neglected. Examination shows that past triumphs of the totalitarian forces can be traced in large measure to the confusion and inter-group squabbles sponsored within communities by fifth columnists and other interested parties.

The chief asset in civil defense against air attack is a thorough knowledge of the nature and deadliness of this type of warfare. The great defense is in learning to face the attack with calmness and prudence. The military units have their work cut out for them, therefore the civilians must marshall resources for passive resistance without direct aid from the Army. Civil life in wartime does not continue along the same lines as before. It calls for closer mobilization of economic and human resources, particularly for economic cooperation to minimize the effect of the damage caused by raiders.

The material provided on the technical phase of civil air defense is similar to previous published matter on the same subject. Recognition of gases, protection against their effects and decontamination after the raid, the extinguishing of incendiary bombs, the protection of buildings against explosives, hygiene in attacked cities and air raid shelter construction and equipment are among the subjects treated.

Under the classification of air defense mobilization, the text outlines alarm and blackout technique, methods for rescue and first aid, the use of existing hospital facilities and the distribution of medical aid. A closing section suggests an organizational structure for air raid defense organizations, training of officers and preparedness for attack on the home front.

This work differs from most other American publications on this subject. It is written out of actual experience with and practical observation of air raid tactics and conditions, and is therefore realistic in approach. It points out directly the potential weaknesses in any air raid defense setup attempted in the country and suggests methods of guarding against potential inadequacy. It does not deal with air raid problems abroad, but suggests a system of defense for American cities in the light of experiences in the bombed cities of Europe.

Air Raid Defense (Civilian), by Curt Wachtel; Chemical Publishing Co., Inc., Brooklyn, N. Y., 1941; 240 pages, $3.50

British Aircraft Instruments

In recent years aircraft instruments have assumed an importance which was hardly anticipated in the early days of aeronautics. As aviation progressed, its development led to the need for increased reliability as well as a wider range in types and uses of aircraft instruments. The repair, servicing, testing and calibration of modern instruments found on British aircraft are treated in detail in this book from a series for English ground engineers.

Introducing the subject is an explanation of the ground engineer's duties in the maintenance and inspection of aircraft instruments. Problems of instrument design are outlined and typical instruments described in sections on tachometers, fuel indicators, thermometers, air speed indicators, inclinometers, altimeters, compasses, turn and bank indicators, rate-of-climb indicators and recording instruments.

With the exception of the Kollsman sensitive altimeter and the Sperry horizon and directional gyro, the instruments discussed differ considerably from American types. There are descriptions of gages and thermometers by Negretti and Zambra, and flight instruments by Smith's Aircraft Instruments, Short and Mason, Henry Hughes & Son, Reid-Sigrist, and Kelvin, Bottomley & Baird. The material of the book is presented in condensed reference manual form and the text is amply illustrated with cuts and explanatory drawings of the instruments described.

Instruments, by R. W. Sloley; 4th edition, Sir Isaac Pitman & Sons, Ltd., London, 1941; 140 pages, 5*s*.

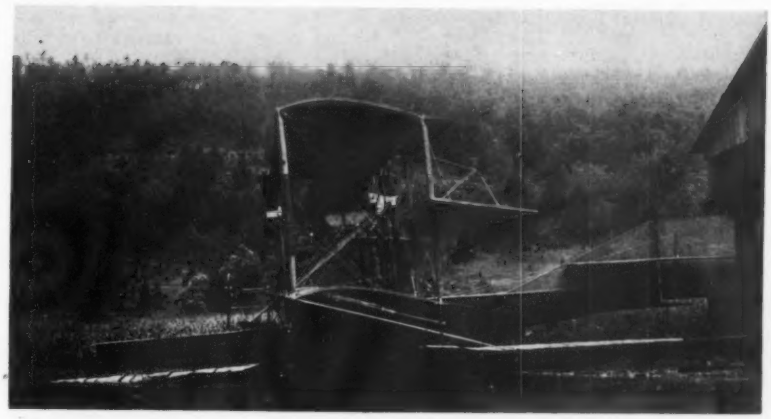
Sheet Metal Text

This survey of the processes and operations involved in cutting and shaping all types of sheet metal describes the metals in general use, listing their characteristics and providing a guide for the selection of metals for specific tasks.

The next step is to familiarize the reader with the formation of a pattern necessary to all but the most elementary sheet metal jobs, before explaining the cutting and formation of sheet metal work with hand tools. Later, the use of more complicated machines to achieve the same results is outlined.

The standard methods of joining sheet metal, mechanical joints, rivets and welds are described in detail in the final part of the book, which closes with a chapter on metal spinning.

Sheet Metal Work, by E. Molloy; Chemical Publishing Company, Inc., New York, 1941; 96 pages, $2.00.



The first successful flying boat, the Curtiss *Flying Fish*, flown from Lake Keuka, N. Y., in 1912. From *Flying Fleets*, by S. Paul Johnston; Duell, Sloan and Pearce, publishers.

Naval Aviation History

A book that will fill a gap on the shelves of any aeronautical library, *Flying Fleets* tells clearly the story of the development of U.S. Naval aviation and describes its mission. In his usual style of presentation, the author subordinates the text to a wealth of pictorial pages which show all phases of over-water flying as done by the U.S. Navy. The presentation of each type of naval aircraft is followed with a detailed description of its purpose and mission.

The historical section of the book will give newcomers to aviation a clear account of how a few courageous young officers braved the cynical attitude of Navy officialdom and lived to see aviation play a predominant role in naval action.

The author's experience, when editor of *Aviation* magazine, in selecting interesting photographs is reflected in the exceptionally fine gravure illustrations which cover more than half the book's pages. The technique of imparting information through pictures is utilized to its limit. A companion book on the Army Air Corps would be welcomed.

Flying Fleets, by S. Paul Johnston; Duell, Sloan & Pearce, Inc., New York, 1941; 188 pages, $3.00.

Manual of Statistical Methods

While *An Engineer's Manual of Statistical Methods*, by Major L. E. Simon, is not a formal textbook on probability, statistics, or logic, it is a summary of certain working parts of these sciences for the practical man whose interest is centered in his industrial or engineering work. It endeavors to place in his hands a working knowledge of statistical methods which, without any serious alteration in his working principles will enable him to achieve given objectives more quickly, surely, and economically.

The presentation is as brief as is compatible with clarity. Controversial and statistical methods of lesser practical importance to industry and engineering are avoided, except where they contribute to the development of more important methods.

The book contains twelve chapters and four appendices, the latter practically in chapter form. Opening with a chapter on making sense out of figures, the author discusses statistical methods and analysis. This is followed by chapters on the inspection of a lot and inspection of related lots, by attributes, and process inspection by attributes. Chapters 5, 6, and 7 cover inspection by variables, while chapter 8 takes up the special case of indeterminate sample size. There are also chapters on sample size, a method of expressing quality and miscellaneous statistical techniques. The appendices include discussions of the incomplete beta-function ratio, predicting from sample to lot, a sample quality control system, specifications and standards of quality.

The principles relating to inspection methods and statistical interference are predicated on recognized standard procedures or on research conducted at the Ballistic Research Laboratory, Aberdeen Proving Ground, incident to various ordnance problems, but principally in connection with designing an inspection procedure for the Army in determining the quality of reserve stocks of ammunition which have suffered partial deterioration. Principles relating to process inspection and control of manufactured products are based upon similar grounds and on experience at a Government manufacturing arsenal.

An Engineer's Manual of Statistical Methods, by Maj. Leslie E. Simon; John Wiley & Sons, Inc., New York, 1941; 231 pages, $2.75.

Industrial Engineering

Profitable operation of large and small manufacturing enterprises under conditions of emergency expansion, emergency taxation, and emergency priority schedules on raw materials is a problem of growing complexity, especially in the aviation industry. Plants have undergone tremendous expansion in a very short time, and while cost-plus contracts offer partial coverage of losses due to many unpredictable factors in figuring costs, well-engineered design of plants, methods, and administration is still of paramount importance in eliminating needless waste of time, manpower and resources.

In *The Design of Manufacturing Enterprises*, Walter Rautenstrauch presents rational methods of design for improving operating characteristics, by discussion and examples chosen from well-known business concerns. Tables, charts, and other essential data are presented, most of the material being taken from case histories of the author's practical experience as an industrial engineer.

Included in treatment is the design of products; design of manufacturing methods and the selection of machinery and equipment; plant layouts; design of organizations for manufacture, marketing, and methods of their management and control; design of the business organization as a whole for integration of production, marketing, and finance; design of the capital structure; and design of the investment structure. Examples are given both from the process and mechanical industries.

While the problems of business analysis and design differ widely in each industry and business concern, the objectives and general methods of analysis are clearly presented. It is believed that the book will be found an interesting and useful introduction to the fundamentals of business and industrial engineering.

The Design of Manufacturing Enterprises, by Walter Rautenstrauch; Pitman Publishing Corporation, New York, 1941; 298 pages, $3.50.

Radio, Instrument Manual

Because of the increase in the demand for pilots holding an instrument rating, Charles A. Zweng's manual on *Radio and Instrument Flying* has been revised and enlarged for the third time in less than eighteen months. Its material has been put abreast of developments and offers pilots and instructors up-to-the-minute information on this important subject.

Subject text covers two-thirds of the book. The remaining third is devoted to quiz-system questions and answers for use in preparing for license examinations.

The book opens with a discussion of instrument flying and instrument training. Flight instruments are shown and described and the pilot technique of instrument turns is outlined. There follow chapters on radio navigation and radio range flying, including a complete description of range stations, radio navigation aids and different type marker beacons.

In the chapter on airport traffic control procedures, light signal, flag signal, and panel signal procedures are given together with message structure phraseologies, and sequence for radio procedures There are also chapters on instrument landing systems, weather bureau service to airmen, and several chapters on meteorology. Dead reckoning problems are treated in the chapter on air navigation. Included are elementary wind triangle and radius of action problems, letdown and climb procedure problems, alternate airport and return to moving base problems and the instrument rating off-course problem.

The quiz section covers questions and answers on the latest examinations, with a special section devoted to questions and answers on the examination for the required radiotelephone operator's permit.

Radio and Instrument Flying, by Charles A. Zweng; 3rd edition, published by the author, Glendale, Calif., 1941; 202 pages, $4.00.

Navigation Workbook

The *Air Navigation Notebook* is designed as a special workbook or logbook for navigation in the air. While it is similar to the navigation notebook used at the U.S. Naval Academy, several new sections have been added. Included are a glossary of navigation terms, solutions and plotting of air navigation problems, and typical navigation questions and answers found on private and commercial pilot examinations.

Most of the book consists of plotting sheets and note page forms on which a permanent record of navigation problems can be kept. The plotting sheets can be used for both dead reckoning and celestial problems, as a longitude convergence scale makes it possible to convert the sheet into a small mercator plotting chart. Plotting is further facilitated by the use of the Department of Commerce Mark II plotter, which consists of a one-piece protractor and ruler with different distance scales marked off on the latter.

Air Navigation Note Book, by Charles A. Zweng; Weems System of Navigation, Annapolis, Md., 1941; 175 pages, $4.00.

For Newcomers to Aviation

Written on the assumption that the majority of those who will seek information from its pages are novices at flying, *Introduction to Aviation* affords a general study of the business of flying. It is true that the technique of flying cannot be learned wholly by textbook, yet it is undeniable that the expert pilot must remain a student of the aeronautical sciences throughout his entire career. These habits of study cannot be acquired too early by the beginner.

This book answers the many questions which arise as one investigates the possibility of learning to fly—the personal qualifications, what has to be learned, the career possibilities, the cost and how to earn a license. These and many other queries which seem formidable to the beginner are answered. The work is practically in syllabus form, but a surprising quantity of information is condensed into its eight chapters.

Included are sections on civil air regulations, personal qualifications for flying, elementary solo flying, advanced and acrobatic flying, navigation, meteorology and occupational information. An appendix contains a glossary of aeronautical terms and a list of review questions and problems.

Introduction to Aviation, by James P. Eames; Chemical Publishing Co., Inc., Brooklyn, N. Y., 1941; 196 pages, $3.50.

Aircraft Engineering
FOUNDED 1929
The Technical and Scientific Aeronautical Monthly
Edited by
Lt.-Col. W. Lockwood Marsh
F.I.Ae.S., M.S.A.E., F.R.Ae.S.

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Elementary Radio

In the preface of *Elementary Handbook for Wireless Operators* by W. E. Cook, the author gives a different and interesting reason for writing the book. He has found from his teaching experience that one special difficulty of most students is an inability to picture clearly and simply the subject as a whole, and the relationship of his daily work to its ultimate aim. Unlike the engine mechanic whose objective is comparatively clear from the start, the radio student finds himself apparently being sidetracked almost daily in lectures, and it is not until the late stages of the course that it begins to take shape as a connected whole.

The purpose of this book is to give the layman or student a clear and comprehensive picture of the subject of radio, and at the same time offer a non-technical and easily understood explanation of its fundamentals. It presents a general treatment of aircraft radio communications, with an introduction to its technique, enabling the student to progress to more comprehensive books and to "see where he is going" when immersed in the intricacies of a radio course. Included are chapters on electrical principles, the transmitter, the receiver, direction finding instruments, power supplies, and simple calculations.

While the author is English, apparently there is little difference in elementary radio instruction between the English and American versions. Minor differences in terminology such as calling radio tubes "valves" will be observed, but these will hardly obscure the general clarity of the text.

Elementary Handbook for Wireless Operators, by W. E. Crook; Sir Isaac Pitman & Sons, Ltd., London, 1941; 102 pages, 4*s*.

Navigation in the R.A.F.

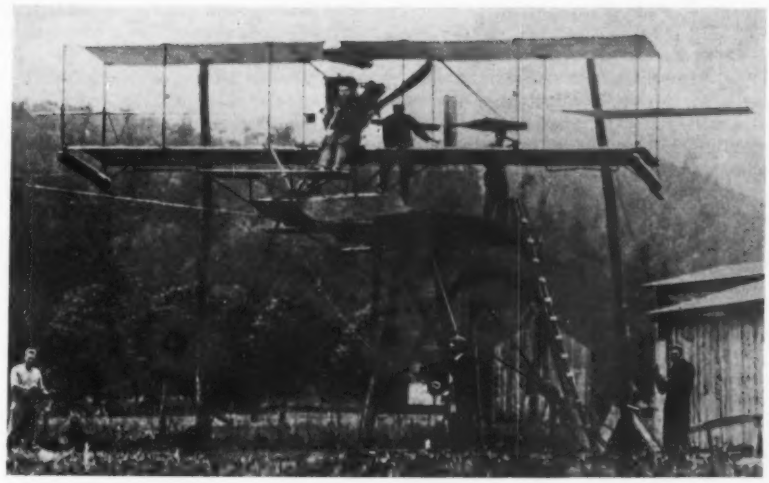
A comprehensive reference work on practical contact and dead reckoning navigation and flight procedures, this work presents the subject as taught and practiced by the Royal Air Force.

Like most military manuals it is practically a notebook. Hundreds of problems encountered in daily operations are solved and explained according to methods used by the Royal Air Force. While many of these pertain to operational procedures and the proper methods for planning, logging and reporting a military flight mission, there is much valuable material on the theory and practice of sharp, accurate, dead reckoning navigation.

The book is divided into eighteen chapters, four of which are on the theory, practice, and problems of dead reckoning navigation. There are also chapters on mathematics, maps and charts, meteorology, instruments, regional control, ground organization, and radio navigation. Useful conversion tables will be found in the appendix, and worthy of mention is a simple graph solution of radius of action problems, once the ground speeds are known. Two lines laid off at right angles to one another are marked with an identical m.p.h. groundspeed scale, beginning at the point of intersection. A third line at 45° or bisecting the angle is also drawn and marked with a scale projected by the following procedure. A ruler is used to connect, say the two points on the outer lines representing groundspeeds of 200 m.p.h. Where it crosses the middle line that point would represent the 100 mile point on the radius of action scale; the two 180 m.p.h. points connected will give the 90 mile point on the radius of action scale, etc. Once the scale is completed, any two groundspeeds (out and back) can be connected and the corresponding radius of action read off the middle scale.

While much of the subject matter on charts, maps, and navigation instruments concerns those in use by the R.A.F. the greater part of the book will be found to be excellent reference material in condensed form.

Manual of Air Navigation; 1st American edition, Chemical Publishing Co., Inc., Brooklyn, N. Y., 1941; 365 pages, $3.50.



Lieut. T. S. Ellyson, the U. S. Navy's first pilot, making an experimenual "tightrope" take-off with a Curtiss hydro at Hammondsport, N. Y., in 1912. From *Flying Fleets* by S. Paul Johnston; Duell, Sloan and Pearce, publishers.

With the R.A.F. in France

The air correspondent of the London *Times* gives a straight reporter's account of what happened to the Advanced Air Striking Force in France during the days before Dunkirk. Like other books on the events of this fateful period, this author also tells of the courage, gallantry and endurance of the R.A.F.'s fighter and bomber pilots. Always outnumbered, but never outfought, they flew and fought until they almost fell asleep on their feet.

Like others before him, this writer tells the inside story of the evacuation of Dunkirk and the R.A.F.'s part in it, the last hours in Paris before the German Army moved in, the roads choked with refugees impeding the arrival of reinforcements at advanced positions. But, most significant are the facts he presents on one of the unrecognized failures of the Allies during this campaign—the failure of proper press relations.

While the Luftwaffe's activities were reported and exploited by the best talent Minister of Propaganda Goebbels could spare, the R.A.F.'s reports on activities were suppressed by a system of censorship executed by officers without knowledge or appreciation of the problems of modern journalism.

Previous to the outbreak of actual war, Charles P. Robertson, the press and publicity officer of the Air Ministry struggled to set up a system of Military Reporters for the R.A.F., selecting and training men who were suitable for the job and assigning them to various fighting units. Having spent time and money equipping these men to report in such a manner that their stories would be accurate and beneficial to civil and military morale, the reporters frequently found themselves hindered and hamstrung by unintelligently administered censorship.

War News Had Wings, by A. H. Narracott; Frederick Muller, Ltd., London, 1941; 244 pages, 8*s*. 6*d*.

R.A.F. Photographs

There is no record of air warfare more vivid or more comprehensive than that made by the camera. Aviation makes a particularly effective subject for photography, and while the number of pictures of actual combat released for publication is relatively small, the number of those that show types of aircraft, flight formations and various air maneuvers has grown to formidable proportions.

The Royal Air Force in Pictures presents a graphic record of the R.A.F. and of the many aircraft it was using at the time of its successful defensive efforts over England during August and September 1940. More than fifty types of British and American military aircraft are shown and described together with a brief outline of where and how they have been used by the R.A.F.

A special section of the book is given over to pictures of the R.A.F. in training and is by far the most interesting part of it. Ground instruction pictures include servicing of fighters, loading bombs and ammunition, and swinging the compass of a fighter, as well as close-ups of crews on duty in the air.

While limitations have been imposed upon the publication of photographs of the newer types of British military aircraft, this volume will be found to contain the most recent available pictures of the majority of present equipment in use both by the R.A.F. and the Fleet Air Arm.

The Royal Air Force in Pictures, edited by Major Oliver Stewart; Country Life Limited, London, 1941; 97 pages, 5*s*.

Airplane Drafting Primer

This text is designed as an introduction of an elementary study of aircraft construction in primary mechanical drawing courses. It permits the student of drafting technique to substitute problems dealing with airplane construction for the standard drawing exercises, thus familiarizing themselves with the airplane and its drafting problems from the beginning of their studies.

The text is so arranged that the drawing instructor may teach from the material without specialized aeronautical training. The textual matter consists of standard instructions on drafting processes, a study of aircraft components and construction and a series of drawing problems involving typical parts of modern aircraft

Airplane Drawing, by J. W. Giachino and H. A. Sonsmith; The Goodheart-Willcox Company, Inc., Chicago, 1941; 72 pages, $1.50.

Pilots of Two Wars

The first half of this book is devoted to retelling the extraordinary flights made by the famous pilots of the World War. It then gives a dramatic account of the experiences of the pilots of the present war. Night raids, "dog fighting" and patrols are vividly described. The exploits of Doran, Kain, Garland and Learoyd as well as many other unnamed pilots are related. In 1940 the pilots of the R.A.F. won 1,600 decorations, including five Victoria Crosses. It is an inspiration to read of the gallant and daring pilots to whom the world owes so much.

Heroes of the Fighting R.A.F., by Leonard R. Gribble; George G. Harrap & Co. Ltd., London, 1941; 204 pages, 5*s*.

Machine Shop Practice

Books which give the beginner a clear idea of the different kinds of work to be found in the field of his choice are particularly useful today when so many people are needed in skilled trades and are exercising once more the privilege of choosing their life's work.

Such an introduction to modern metal working is the *New Encyclopedia of Machine Shop Practice.* Its editor is professor of production practice at Stevens Institute of Technology. Designed for popular use in schools, vocational courses, home study and for plant reference libraries, the book affords illustrated general descriptions of hundreds of machine shop operations.

The sixteen chapters of the book have been written by various specialists in particular fields. Among those who contributed to the work are John Wayne, Denis Laycock, H. C. Town, John D. Watson, Eric N. Simons, J. S. Murphy, E. D. Howard, Ronald Smith, J. W. Broadbent and W. A. Tuplin. A copious subject index and a thumb index for sections permit ready reference. The language is plain and readily intelligible to the untutored student.

New Encyclopedia of Machine Shop Practice, edited by George W. Barnwell; Wm. H. Wise & Co., New York, 1941; 568 pages, $1.98.

Aviation History for the Young

Medal of the Month Club. A pamphlet outlining the plan and purpose of this interesting effort to increase the interest of young people in famous pilots has been prepared by Miss Felicity Buranelli, New York. She originated the plan and has already issued medals of the Wright Brothers, Amelia Earhart and Ed Musick. These are to be followed each month by others of equal prominence.

Each medal has a short statement on the reverse side regarding the outstanding achievements of the pilot and is intended to stimulate the spirit of American achievement in children. Clubs are being formed and youth are starting to make collections of the medals. A special medal is available for collectors.

Book Notes

British and German Aircraft; Gale & Polden Ltd., Aldershot, England, 1941; 31 pages, 9*d*.

Silhouettes and general description of the most important British and German aircraft with particulars of their functions and characteristics.

America Can Win, by Maj. Malcolm Wheeler-Nicholson, The Macmillan Company, New York, 1941; 245 pages, $1.75.

An analysis of the present war, comparing the military strength of Great Britain and the Axis. The writer attempts to show the danger to the United States in the "aid short of war" policy, stating that it is the course followed by the fallen democracies.

Medical Manual of Chemical Warfare; Chemical Publishing Company, Inc., New York, 1941; 119 pages, $2.50.

A résumé of the effects of chemical warfare substances and the methods that may be adopted to minimize them.

Antiaircraft Defense; The Military Service Publishing Company, Harrisburg, 1941; 603 pages, $2.00.

A study of anti-aircraft weapons and their use, the organization of ground defenses against air attack, general provisions for target practice for anti-aircraft units and a general review of anti-aircraft tactics.

Definitions and Formulae for Students, by John F. Frier; Sir Isaac Pitman & Sons, Ltd., London, 1941; 42 pages, 6*d*.

A compilation of about 200 common definitions and a selection of the most used formulas in aeronautical engineering. The handbook contains suitable data on aerodynamics, propellers, performance and similar phases of aviation, listed and indexed for ready reference.

Aircraft Recognition, by R. A. Saville-Sneath; Penguin Books, New York, 1941; 174 pages, $0.25.

Popular type work on aircraft recognition, written especially for ground observers who desire to be able to distinguish between friendly and hostile aircraft. The characteristics by which aircraft can be recognized and grouped are given, with particular stress laid on careful differentiation between similar purpose aircraft which look somewhat alike. Silhouettes of many types in current use are provided with general material on their construction, features and use.

Engineering Workshop Manual, by E. Pull; The Technical Press Ltd., London, 1941; 249 pages, 4*s*.

A handbook for engineering shop apprentices, fitters, turners and general machinists, containing practical information on micrometers, verniers, tools, screw-cutting, workshop arithmetic, geometry, mensuration, gear cutting, precision grinding and general machine work. General shop rules and tables in common use are also included.

600 Questions and Answers on Air Force Law, by Wing Commander H. M. Shurlock; Gale & Polden Ltd., London, 1941; 152 pages, 5*s*.

A practical guide to military law, designed to assist officers of the Royal Air Force in their administrative duties and in study on this subject preparatory to promotion examinations.

Sixty-Year Index of A.S.M.E. Technical Papers; American Society of Mechanical Engineers, New York, 1941; 189 pages, $3.75.

A "finding list" of the technical papers printed in the regular publications of the A.S.M.E., *The Journal of Applied Mechanics, Journal of the A.S.M.E.* and *Mechanical Engineering* from 1880 to 1939.

Calculos de Performance de las Avionetas (Calculating the Performance of Aircraft), by Juan Klein Serralles; Aviation Press, San Francisco, 1941; 76 pages, $2.00.

Written in Spanish for Latin American use, this work presents the methods used in calculating and determining the flight characteristics of light aircraft, based on N.A.C.A. investigations and adapted to the metric system.

Equilibrio, Estabilidad y Control de los Aeroplanos (Equilibrium, Stability and Control of the Airplane), by Juan Klein Serralles; Aviation Press, San Francisco, 1941; 104 pages, $2.00.

Explanation of the theory of various design and construction methods used to insure the safety of airplanes in flight.

The Stereographic Projection, by F. W. Sohon, Chemical Publishing Co., Inc., New York, 1941; 210 pages, $4.00.

A study of stereographic projection as applied to the study of cartography and complex variables. The study outline is useful to chrystallographers and seismologists, and may also be used in solving certain problems in hydrodynamics.

Library Accessions

Theorie der Luftkraefte (Theory of Aerodynamic Forces), by R. Fuchs; Julius Springer, Berlin, 1935; 310 pages.

The second volume in the series, *Aerodynamik* (*Aerodynamics*), by R. Fuchs, L. Hopf and Fr. Seewald. This treatise on aerodynamics is a revision and enlargement of part one of the first edition. It discusses the theoretical principles of flight and presents the results in a form suitable for direct application to airplane design.

Aircraft Performance Testing, by S. Scott Hall and T. H. England; Pitman Publishing Corporation, New York, 1933; 206 pages.

A survey of British methods employed in performance testing. Performance calculations are given for two airplanes, one fitted with a normally aspirated engine and the other with a supercharged engine.

Aluminum in Aircraft; Aluminum Company of America, Pittsburgh, 1930; 159 pages.

Characteristics, properties and application of aluminum alloys to aircraft.

ANC-1(1) Spanwise Air-Load Distribution; issued by the Army-Navy-Commerce Committee on Aircraft Requirements, U.S. Govt. Print. Off., Washington, 1938; 115 pages.

Theoretical procedure, based upon a study made by the N.A.C.A., for determining the span load distribution of any wing.

Applied Wing Theory, by Elliott G. Reid; McGraw-Hill Book Company, Inc., New York, 1932; 231 pages.

A presentation of those phases of aerodynamic theory which are of fundamental importance in airplane design.

Elastic Energy Theory, by J. A. Van Den Broek; John Wiley and Sons, Inc., New York, 1931; 260 pages.

Application of the principles of conservation of energy to a wide range of problems in structural design.

Entwurf und Berechnung von Flugzeugen, Band I., Tragfluegel Freitragender Tiefdecker (Design and Calculation of Airplanes, Volume I, Wings of Cantilever Low Wing Monoplanes), by Gerhard Otto; C. J. E. Volckmann Nachf. E. Wette, Berlin-Charlottenburg, 1937; 88 pages.

The application of the fundamental principles of structural theory to practical airplane wing design.

Flugtechnisches Handbuch, Band I., Aerodynamik und Flugzeugbau (Aeronautical Handbook, Volume I, Aerodynamics and Airplane Construction), edited by Roland Eisenlohr; Walter de Gruyter & Co., Berlin, 1936; 166 pages.

A compilation of articles by various authors on the principles of flight and their application to airplane construction. A chapter on the properties of airplane materials is included.

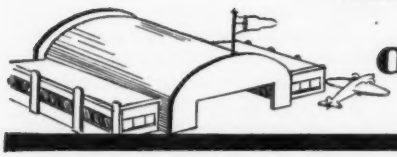
Entwurf und Berechnung von Flugzeugen, Band II., Rumpf (Design and Calculation of Airplanes, Volume II, Fuselage), by Gerhard Otto; C. J. E. Volckmann Nachf. E. Wette, Berlin-Charlottenburg, 1938; 96 pages.

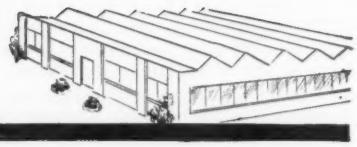
Fuselage calculation of the He-64 for six different load conditions.

Internal-Combustion Engineering, revised and edited by A. T. J. Kersey;

(*Continued on page 47*)

House Organs and Catalogues





Spark Plug Manual

Service and Maintenance Manual. A general manual of 30 pages on the service and maintenance of BG spark plugs, giving specifications for proper tools and outlining the essential procedure for inspecting, cleaning, disassembling, repairing and reassembling various types of plugs.

The servicing directions include specific instructions for cleaning and shaping core electrodes and shells, removal of rust, shell bluing, rust prevention, and inspection and testing. *The BG Corporation.*

Wire Rope Catalogue

A new 166-page general catalogue on wire rope and allied products has been issued by the *Macwhyte Company* of Kenosha, Wisconsin. Among the general classifications is one section on aircraft cable of both flexible and non-flexible texture. Tables of diameters, materials and strengths are given, as well as general directions for their handling. A glossary of general terms used in the wire rope industry is also included.

Introduction to a Plant

Welcome. In order to acquaint new employees with the history, background and activities of the factory, the management of *Pratt and Whitney Aircraft* have issued a booklet containing a map of the plant and other important data useful to the newcomers. It outlines the progress of the company since its beginning in 1925, the employee benefits such as group insurance, hospitalization, medical aid and the credit union, and describes the publications and social activities sponsored by the company.

Using Leather

Leather Packings in Aircraft. While the use of leather in aircraft is not frequently apparent, it has an important place in hydraulic systems, according to this technical note. Leather packings are used on hydraulic controls, shock struts, feathering valves, bomb bay doors, windshield wipers, automatic pilots, etc. The method by which leathers are impregnated for various aircraft uses is described and the standards they must meet are given. *The Houghton Line*, June.

Men Wanted

How to Get a Consair Job. Consolidated Aircraft's personnel director, J. H. Waterbury, is canvassing the plant's employees, seeking to have them contact friends and relatives to fill the 40,000 positions which will be open soon in San Diego and the new Fort Worth plant. This article outlines the general qualifications for employment and suggests the best procedure for individuals who wish to secure work with the company. *Consolidator*, August.

California Airplanes

Los Angeles County Aircraft Directory. Pictures, dimensions, power plants and, where available, performance data on military and civil aircraft built in Los Angeles county, California. The manufacturers represented include Lockheed, Douglas, Northrop, Vultee, North American, Boeing (built by Douglas and Vega), Harlow, Interstate, Fletcher, Timms, Ryan, Bowlus, Briegleb, and Consolidated. *Los Angeles County Chamber of Commerce.*

Glider Types

A folder on three types of gliders built by the *Briegleb Aircraft Company*, Van Nuys, California. The BG-6 is a single-place glider, designed for training, towing and soaring. The BG-7 is a tapered-wing sailplane, having the same fuselage and tail group as the 6, while the BG-8 is a two-place, fully-enclosed sailplane, equipped for dual instruction, airplane tow and night and instrument flying.

Training for Defense

The Role Aviation Training Plays in National Defense. Carl Norcross. There is a mistaken belief, this writer points out, that airplane plants working on national defense orders have reached the peak of their expansion and that few more men will be needed. This is disproved by a statement made recently by Col. John H. Jouett, president of the Aeronautical Chamber of Commerce when he showed that aviation employment more than trebled from January 1940 to June 1941, and was expected to double again by next year.

This indicates the necessity for schools to train more men for aviation employment and that provision must be made for giving these new men additional training so that they may become efficient workers.

The trend in aviation education is toward stepping up the speed of training, giving more practical instruction in modern methods and with currently used materials. Closer relationship between schools and factories has resulted in the training of men in more specific fields, making them available for immediate use in production.

This article appears in the first number of a new house publication of the McGraw-Hill Book Company in the interest of technical schools and defense training courses. *Technical Education News*, August.

Folder on Trainer

Description, specifications and performance data on the Meyers combined primary and advanced trainer are included in a promotional folder on the new biplane type. The trainer is available with a choice of Ken Royce or Warner 125 and 145 hp. engine. *Meyers Aircraft Company.*

Plant History

The entire contents of the July-August issue of the *Curtiss Fly Leaf* is given to the history, description and background of the newly opened airplane plant of the Curtiss-Wright Corporation. It is built on a 124-acre site adjacent to the Buffalo Municipal Airport.

Among the various accounts are articles on the unexpected problems which arise in building a plant, such as land holdouts, freezing concrete and moving parts, equipment, offices and personnel from one plant to another with a minimum loss of time. The educational program by which new personnel is being trained for the expanded production facilities is also outlined.

Balloon Demonstration

Barrage. Balloon's Share in Defense Demonstration. An account of an open demonstration of all six types of barrage balloons built by the Goodyear Aircraft Corp. for the U.S. Army's newest anti-aircraft program. Held at the Wingfoot Lake air station near Akron, the exhibition included the new Strato-Sentinal—a 68,000-cu.ft. balloon which is built to service at 15,000 ft. Descriptions are given of all the balloons. *The Goodyear News*, August.

Aircraft Aluminum Plant

West Coast Airplane Plants Get Los Angeles Aluminum. A picture survey of the progress made on the construction of expanded plant facilities at the Vernon works of the Aluminum Company of America on the outskirts of Los Angeles. The plant, started in 1938 to provide the few sand castings which the local aircraft industry required, is being enlarged 455 per cent in area and its productive capacity increased 350 per cent. This expansion is part of the $200,000,000 program to increase aluminum production needed for defense. *Aluminum News Letter*, July.

Addition to Link Trainer

Outwitting the Wind. One of the newest additions to the Link Trainer is the Wind Simulator, a device attached to existing trainers used for instrument flight practice. The simulator introduces the element of existing winds into the ground study of radio range flying by enabling the operator to send appropriate radio signals to the pilot in the trainer, causing the pilot to fly the course exactly as he would under given conditions.

The article explains the nature and installation of the simulator, and suggests a new technique for making procedure turns by methods evolved from research with the new device. *The Air Line Pilot*, July.

Air Raid Shelter Pests

Underground Mosquitoes. A curious side light on London's air raid shelter problem is the appearance of increasing numbers of a species of mosquito, the *Culex molestus*, which have made their appearance in the London subways since they have been used as air raid shelters.

Mosquitoes cannot breed without frequent meals on human blood, and this species which breeds throughout the year at a level 100 feet below surface formerly got little chance to contact humans in the crowded trains. With hundreds of persons being driven into the stations by the air raids, the number of these pests has increased greatly.

The article describes the steps that have been taken to control their breeding by treating the shallow pools in which larvae are found. *What's New*, September.

"Patriotic Cooperative"

Flying Fortresses by Douglas. A program for the production of 500 Boeing B-17E four-engine bombers has been launched by the Army Air Corps, using the Boeing plants at Seattle and Wichita, Douglas Aircraft Company's recently constructed "blackout factory" at Long Beach, California, and the Vega Aircraft plant at Burbank. This program, operating under a master planning group known as the BVD committee consists of an Army representative and the chief engineers of the three companies.

Three subcommittees on tooling, information and procurement operate under the master group, enabling the Douglas and Vega companies to get into production as quickly as possible by furnishing blueprints, master templates and detailed drawings of jigs and tools used by Boeing. Certain modifications which had to be made in the "Flying Fortress" to fit it into the highly mechanized production methods used at Douglas's Long Beach plant are noted. *Douglas Airview*, July.

Testing Machines

Southwark-Tate-Emery Testing Machines and Allied Equipment. A profusely illustrated catalogue describing this line of testing machines in capacities from 20,000-lb. to 4,000,000-lb. Photographs show standard and special test setups on specimen and full sized structures. Subjects under test include, among others, airplane wing sections and engine mounts, riveted joints, gears, girders and concrete blocks.

General specifications and a detailed description of the operation of standard Southwark-Tate-Emery universal testing machines are included along with brief presentations on four other types of Southwark physical testing machines. These include a machine for testing cement and concrete, horizontal machines, high capacity floor types and a new lapped-ram unit.

The second section of the bulletin is devoted to accessories—recorder, load maintainers and control apparatus. Seven types of grips are illustrated for the testing of various types and sizes of specimens. A particularly interesting photograph in this section shows a group of 8 proving rings during calibration of a 3,000,000-lb. testing machine. *Baldwin Southwark Division*, Baldwin Locomotive Works.

Valve History

The Sodium-Cooled Valve. A history and description of sodium-cooled valves and their operation is afforded in this 14-page booklet. This type of valve was originally developed from the work of S. D. Heron at McCook Field. The advantages of self-cooling valves are explained along with the cooling action of the pure sodium inside the valve. Some details of manufacture are given. *Wilcox-Rich Division, Eaton Manufacturing Co.*

Traffic Control Radio

Descriptive folders have been issued by *Radio Receptor Co., Inc.*, on ultra high frequency radio equipment designed for airport traffic control and ground - to - airplane communications. General details, applications and electrical and mechanical characteristics are given on 50 and 125-watt transmitters, communications aircraft receivers and a horizontally polarized antenna similar to those used in television and frequency modulation broadcasting.

Aircraft Parts

Engineering Data. A catalogue of 70 pages in a flexible binder containing data sheets and prices on standard aircraft parts manufactured or distributed by the company. Bolts, nuts, washers, rivets, terminals, hydraulic equipment, cables, clamps, fittings and tubing are described, as well as interphone and radio equipment, windshield wipers and similar aircraft parts.

Wherever feasible, drawings or photographs are provided to augment such useful engineering information as weight, tensile strength, exact dimensions and available finish. *Air Associates, Inc.*

Air Warfare

Incendiary Bombs. Charles G. Durfee. A paper delivered before the New Jersey Fire Chief's Association, on the burning characteristics and methods of coping with modern types of incendiary bombs. Thermit bombs, oil bombs and phosphorous "calling cards" are described together with methods used by the British to extinguish them. The greater part of the paper deals with the problem of magnesium incendiaries and a newly developed extinguishing agent, a powder with a graphite base which is inert to burning magnesium. Added products are complex heavy chemicals which, under the intense heat of the magnesium fire, will vaporize and form a heavy, dense gas blanket through and above the powder blanket, effectually halting all combustion. *Pyrene Manufacturing Company.*

Oven Catalogue

A descriptive booklet of 12 pages describes various types of baking and drying ovens and indicates the types of equipment available for specific work such as heat-treatment of metals and finish-drying. Also outlined are conveyor systems by which the ovens could be fitted into production systems. Information is provided on the distribution of heat to assure uniform finishes. *Despatch Oven Co.*

Flying a DB-7

300 MPH—Plenty Plus. Devon Francis. An account of a flight in a Douglas DB-7, a twin-engine attack bomber built for low altitude bombing, troop strafing and general support of ground forces. The pilot was Jim Haizlip, Bendix Trophy winner and one-time holder of the transcontinental speed record. The writer, the first non-governmental civilian ever permitted to ride in this type, relates the sensations of the flight and gives some inkling of the airplane's construction and performance. *Douglas Airview*, July.

Airport Maintenance

Drainage for the Backyard Airport. Keeping a small private airport requires more than a level field and a windsock, this article points out. Improperly drained, the strip may be turned into a quagmire by heavy rains. It is suggested that the builder can assemble much useful data for the civil engineer laying out a drainage system, for example the general rainfall record, soil analysis, test boring, etc. The use of existing natural drainage is advised and the laying of drain pipes to augment it is explained. *A.O.P.A. Section*, August.

BG Spark Plugs

Catalogue 38. A 16-page loose-leaf brochure on BG aviation spark plugs describes the various types of mica insulated plugs, elbows and terminal sleeves built by the company. Service kits and pressure testing devices are listed along with a new combination tool for electrode forming and adjusting.

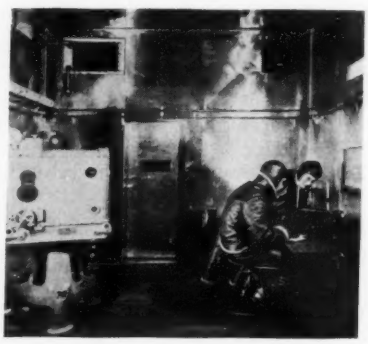
Standards for proper plug selection are given with a listing of proper plugs for standard types of American, English and French airplane engines. *The BG Corporation.*

Aircraft Roller Bearings

Data sheets on Shafer self-aligning roller bearings, designed especially for aircraft, explain the method by which this bearing can accomplish self-alignment of from three to ten degrees. Cross-section drawings and specifications for double row concave self-aligning bearings, turnbuckle eye and rod end bearings are provided. Suggestions are offered on typical applications in airplane construction. *Shafer Bearing Corporation.*

Tool Catalogue

Portable Electric Tools. Data on portable electric tools especially designed for aircraft production and maintenance are presented in this 18-page brochure. Several types of hand and stand drills, buffers, grinders, shears and cleaners are described along with special machines for grinding aircraft valves and valve seats. Tool specifications for the use of these machines on various types of American and English engines are listed. *The Black and Decker Mfg. Co.*



Interior view of the Sperry Gyroscope Co.'s "all weather" laboratory, used for testing aviation equipment under simulated service conditions. In this chamber, tropic heat, cold to −35°F., rain and fog can be produced artificially.

Microfinishing Equipment

New Micromatic Hydrohoners. An equipment catalogue on these machines, which combine automatic honing with automatic microsize control. The sixteen pages are given to a description of the two standard models of hydrohoners and an explanation of the methods used to adopt them to precision production work.

Special attention is given the use of the machine in the production of hydraulic and aircraft engine parts as well as special aircraft parts requiring work within close tolerances. Special tools and fittings used with the hydrohoner and condensed specifications of the two models are also given. *Micromatic Hone Corporation.*

Aluminum Melting Furnaces

A folder issued recently by the *Fisher Furnace Company* of Chicago describes six types of gas-fired aluminum melting furnaces. The furnaces were designed for foundry work, some of them to be oil-fired if gas is not available. Capacities vary from 250 to 2,500 lbs. Stationary and tilting types are included in the line.

Plans in Perspective

Production by Pictures. One of the important steps to increase production taken recently by the Boeing Company is the adoption of a system of production illustrations, perspective drawings of assemblies, replacing in many instances the conventional blueprints. This is particularly helpful to employees new to aircraft construction, who have not been trained in blueprint reading.

The new system, used first in England, was introduced into the American airplane plants by Douglas Aircraft and was brought to Boeing when they started to build DB-7s. The article describes the making of these drawings and the difference between them and the regular blueprints. *Boeing News, August.*

Progress Record

This manual of defense data for the second quarter of 1941 reports the progress of the aircraft industry in national defense production and indicates the specific increases in unit production, floor space, employment, payrolls and man hours. A directory of bomber, fighter and trainer types being exported to England is included with a general description of the seven new types recently announced as ready for service in this country and abroad.

A list of the 67 models of light airplanes built in the United States is presented with suggestions for their many defense potentialities besides primary training. Some of these uses are airline instrument training, reservoir and pipeline patrol and numerous policing activities. *Aircraft Record*, August.

Works Manager

"Perpetually Working." An outline of the career of Perry William Brown, assistant works manager for the Wright Aeronautical Corporation. Brown started his career as a tool designer and marine engineer. A picture of Glenn Curtiss and a desire to see Niagara Falls took him to Buffalo some 24 years ago, where Curtiss put him to work designing tools for engine production.

Brown has been responsible for the tooling of six plants in the recent Wright expansion program and the change in line production methods now being installed by Wright Aeronautical. *Trade Winds*, August.

(Continued on page 67)

From the Industry

Civil Aeronautics Administration

Reporting on the status of the U.S. Civil Airways as of September 1, 1941, C.A.A. Administrator Donald H. Connolly has released figures on Civil Airways expansion, with the comment that "Under the stimulus of national defense, and despite the difficulties imposed in some cases by shortages of labor and supplies, expansion continued during the past twelve months."

Lighted, operating airways increased by 2,168 miles, making a total of 30,913. There are 1,945 additional miles under construction and 921 under survey. For navigational facilities along the airways, there are now 2,276 beacons as against 2,207 a year ago, and 310 intermediate landing fields as opposed to 296 a year ago.

The teletype system for transmitting instructions and information in the direction of airways traffic increased from 11,880 to 13,292 miles; the weather recording stations had a teletype mileage of 27,068 last year and now has 29,422. An additional national teletype network of 24,269 miles is nearing completion.

An important part of the airways expansion program was the construction of 26 additional radio range and communications stations to meet the need of radio range, communication and weather-reporting service for new operations and to extend these services for existing operations. These additions now bring the total to 114 full power, 139 medium power, 39 low power radio range and communication stations in operation.

According to C. B. Haynes, Air Safety specialist on meteorology, aircraft operators along the Gulf Coast, in Florida and along the Eastern Seaboard should be on the alert for hurricanes during the months from June to November and should be ready to take quick steps to prevent the loss of life or property which may be caused by these violent storms. There is no regularity in the number of tropical storms which might occur in any given year. The peak of the season is in August, September and October.

The United States Weather Bureau now maintains an efficient Hurricane Warning Service, which collects reports from an extensive network of land stations and ships at sea, issues forecasts and warnings and distributes this information to the public by radio, telephone, telegraph, and newspaper. The warnings issued by forecast centers give the position of the storm center, its intensity and the direction and rate of movement. When the hurricane is approaching the coast line the time and place of arrival are forecast together with a statement of the effects to be experienced, such as the onset of high tides or destructive winds with their direction and probable duration.

In most cases the pilot or operator will be concerned with the protection of his aircraft while on the ground, although the warnings may enable him to move the aircraft to another airport which will not be affected by the storm. This is usually the safest procedure to follow.

Several features of a hurricane should be considered in determining the best method of protection. The winds in the hurricane rotate in a counter-clockwise direction and the velocity often reaches 125 to 150 m.p.h. Very strong gusts accompany these high winds and the gust velocity may be 50 per cent higher than the average velocity. There is a central "eye" which has relatively calm winds. The diameter of the "eye" averages about 14 miles. If the center of the hurricane passes the station, the wind will gradually build up to a maximum velocity, then there will be a sudden decrease of wind and a partial clearing lasting from 15 minutes to one hour as the "eye" passes, then a sudden and violent wind in the opposite direction to the first strong wind which will last for perhaps another hour. In small hurricanes the diameter of the area of destructive winds may not exceed 25 miles, while in some of the greatest the diameter may be as much as 500 miles.

Along the coast line the tides which accompany the hurricane as it approaches the continent may range from 10 to 16 feet above normal. The inundations by high tide and flood rains have caused greater loss of life and property than the high winds of the hurricane. Rainfall amounts in excess of 30 inches in a 24-hour period are not uncommon. The rainfall may begin 12 to 18 hours before the arrival of the storm center and last for 18 hours after the center has passed. The greatest rainfall intensities occur near the center.

The safeguarding of aircraft and equipment during a hurricane then involves the following: (1) Protection from high winds (strong, well-built hangars. It is considered good practice to leave a crack in the hangar doors to allow internal and external pressure to equalize more readily). (2) Protection from floods.

It is not advisable to fly in the vicinity of a hurricane because of severe turbulence, heavy rain and reduction of visability, strong winds and extreme gustiness near the ground during landing. In flying around a hurricane keep at least 250 miles away from the center and if possible fly to the right of the storm to take advantage of tail winds.

As a new group of 12,000 start into the Fall course of the C.A.A. pilot training program with the opening of school, the rates for their insurance have again been voluntarily lowered, Administrator Connolly announced recently. For the sixth time since the start of the Civil Pilot Training Program in 1939, insurance companies have voluntarily lowered their premium charges.

Student pilots, before the C.A.A. program, paid $35 for $3,000 life insurance during their training period. When the program was started, the insurance companies set the rate at $20. It has by now been reduced to $7.20 for elementary students. These rates cover the student against accidents in ground transportation to and from the flying field. C.A.A. trainees have piled up a safety record never before equalled,

Releases are printed as received from companies and other aeronautical organizations and the responsibility for the accuracy of all statements is therefore not assured by the Aeronautical Review.

flying more than 6,200,000 miles per fatality in the "controlled" flight instruction courses.

Emphasis in the Fall program will be on the training of instructors to prevent the bottleneck now threatening in both civil and military pilot training schools. Of the 500 colleges to engage in the Fall program, 210 will give both elementary and secondary ground school training; while of 542 flight contractors listed, 226 will give both elementary and secondary flight courses.

The change in emphasis in the Fall program will result in 8,010 scholarships for the elementary course in the colleges, and 3,250 for the secondary course. As a result of the Summer course in the non-college phase, where ground school students complete for subsequent flying courses, approximately 1,300 elementary flight courses will be given during the Fall. The next non-college ground school classes will start January 2, 1942.

U.S. Army

War Department releases indicate that in order to promote the development and procurement of all types of aircraft and aviation equipment now being supplied to nations defending themselves against aggressors, Maj. Gen. George H. Brett, Chief of the Army Air Corps, will tour with a staff of Air Corps experts the African, Near East, Mediterranean, and Atlantic war fronts. No announcement will be made of the date of departure.

A similar tour is to be made by Lieut. Col. E. M. Powers, Air Corps, and a party to include Major James H. Doolittle, Air Corps. They will meet General Brett's party at certain points of the war fronts.

His aerial tour of the principal battle zones will give General Brett and members of his special staff a firsthand opportunity to determine the needs of the British for equipment manufactured by American industry. An opportunity will also be provided for a personal study of two particularly pressing problems—those relating to the maintenance and repair of aeronautical equipment and those relating to supply. Second in importance only to the actual manufacture and delivery of the aircraft needed to support defense is the maintenance and supply of such aircraft once it has reached the war zone.

The supply and maintenance of American aircraft in the war zones has been made more difficult because of a lack of personnel familiar with these aircraft and American equipment. One of the important features of General Brett's studies is to be that of the maintenance personnel problem. Spare parts and supplies must be provided in the proper proportions.

Provisions must be made for supplying and training the necessary personnel in the maintenance and use of American equipment. Different procedures must be set up for each zone due to local conditions. Which method or combination of methods is to be adopted must be determined.

It is hoped that the results of General Brett's studies in the war zones will make possible the elimination of existing bottlenecks in the use of American equipment.

Army maneuvers in Louisiana this month will mark the first time that parachute troops will have been employed by the Army in large-scale maneuvers, according to announcements from the War Department. Elements of the 502nd parachute battalion, comprising about 500 men fresh from ten weeks of training, are to drop during some phase of the battle operations.

The location of parachute troop assignment and the hour and place for dropping are to remain secret. The parachutists will meet their airplanes, a few at each advance base, to round out the combat team. Then, possibly under cover of night, the airplanes will take off from the scattered jumping-off bases for a specified point in the air where the whole force will meet and proceed to the mission. The troops will be armed and equipped as for actual combat.

The last of a series of experimental training courses in glider flying for selected Army Air Corps officers began August 24, at the Elmira Gliding Area Soaring Corporation in Elmira, according to the War Department. The course, of four weeks' duration, was to be attended by six Air Corps officers. Eighteen Army pilots had already completed experimental courses in motorless flight.

Twelve fliers were trained in three-week courses starting in June. These courses used two-place, eight-place and fifteen-place gliders. The four-week course uses only two-place gliders. Results of the present experimental training program are to be checked to determine the length of courses and type of training needed by glider pilots.

Army plans for the use of gliders were indicated in the recent announcement of the creation of five new Air Support Commands directing the use of "troop-carrying glider units." The Air Corps officers trained this summer are expected to be available as instructors and supervisors should glider training be expanded in the Army.

The War Department has reported that two new cargo airplanes, for the transportation of air troops or equipment, and two new transports are now undergoing tests by the Army Air Corps. The cargo airplanes, designated as the C-47 and the C-53, are manufactured by Douglas Aircraft Company, Inc. The transports, designated C-56 and C-57, are manufactured by the Lockheed Aircraft Company.

The C-47, similar to the DC-3 used by commercial airlines, is equipped to carry heavy cargo. It is a low-wing all-metal monoplane, powered by two Pratt and Whitney 14-cylinder radial engines of 1,200 hp. turning three-bladed propellers 11 ft. 6 in. in diameter. A large loading door in the side and a reinforced floor make possible the transportation of engines and other heavy cargo.

The C-53 light cargo airplane is similar to the C-47, but does not have the large cargo-loading door. The cabin floor is reinforced only for light cargo. The cabin of both airplanes is permanently equipped with folding benches to accommodate 28 parachute troops and their equipment.

The two transport airplanes are all-metal, midwing, cantilever monoplanes with twin tail assemblies and conventional retractable landing gears. Each craft has a wing span of 65 ft. 6 in., is 49 ft. 10 in. long and has a gross weight of 17,500 lbs. Each carries a crew of two pilots.

The C-56 is powered with two 1,100 hp. 9-cylinder Wright engines. Interior fittings are the executive type, which includes tables and other facilities for administrative use when in flight. The C-57 is powered with two Pratt & Whitney 1,200 hp. 14-cylinder engines, and is fitted with 15 standard airline chairs for the transport of personnel. Both airplanes have their commercial counterpart in the Lockheed 18 Lodestar.

The Army Air Forces have received for tests the first P-40F airplane, latest development in the Curtiss-Wright P-40 series that are in general use in the Army Air Forces and in the R.A.F. Heavily armed and armored the P-40F is equipped with leak-proof tanks.

The new type is similar in external appearance to the other airplanes of the series, which are powered with Allison liquid-cooled engines. But, the P-40F is powered with a Rolls Royce "Merlin" engine of the type manufactured by the Packard Motor Car Company. The engine is a 12-cylinder V-type, liquid-cooled power plant capable of 1,105 hp. at an altitude of more than 20,000 ft.

Taylorcraft Aviation Corporation has delivered to the Air Corps the first of several YO-57 small liaison airplanes used especially for observation and direction of troop movements from the

air. The two-place craft is especially suited for reconnaissance and message-carrying jobs. Two-way radio equipment installed in the high-wing, strut-braced monoplane makes possible immediate communication with ground forces. Several of the airplanes will be delivered to the Army. The test plane is powered with a Continental 4-cylinder, 65 hp. motor.

Aeronautical Chamber of Commerce of America

An Aviation News Committee report shows impressive gains in the productive effort of American airplane builders during July. The month developed an increase of more than 5,000,000 man-hours, an important index to the growing production, particularly since the period was broken by the July 4 holiday. Other increases were shown to be 18,354 new employees, $664,784 increase in weekly payrolls and an increase of 1,858,727 sq.ft. in factory floor space.

American Society for Testing Materials

The A.S.T.M. has recently reported on its studies of the conservation of aluminum used in zinc-base die-casting alloys. Under the sponsorship of the A.S.T.M. committee on die-cast metals and alloys, a series of investigations has been under way looking toward the possible reduction in aluminum content from about 4 per cent to about 1.5 to 2.0 per cent in the widely used alloys Nos. XXIII and XXV in the A.S.T.M. Specifications for Zinc-Base Alloy Die Castings (B86-38T).

Before recommending any definite steps in the conservation of this strategic material, the committee has undertaken some positive tests to clarify certain questions which have been raised concerning possible manufacturing difficulties which may be encountered relating to hot-shortness, shrinkage, freezing range and casting characteristics of the lower aluminum alloys.

The two zinc alloys most commonly used in the die casting trade today are A.S.T.M. alloys XXIII and XXV covered in Specifications B86-38T. Alloy XXIII is a zinc-base alloy containing 4 per cent aluminum and about 0.03 per cent magnesium. Alloy XXV differs by the inclusion of 1 per cent copper. Both alloys are compounded with special high grade (99.99 per cent) zinc, A.S.T.M. Specifications B6-37.

The eutectic in the zinc-aluminum system occurs at about 5 per cent aluminum. Alloys containing 4 per cent aluminum are therefore close to the eutectic composition and have a short freezing range. As a result, they possess a minimum of casting difficulties, and the adoption of this aluminum content in the development of these alloys was based largely on the good casting properties coupled with what appeared to be the optimum combination of physical properties.

These standard alloys have been in commercial use for over 10 years with satisfactory service records. Now, because of the aluminum shortage, the possibility of using alloys with less than 4 per cent aluminum is being investigated. Preliminary results based on laboratory tests are now available and some conflicting commercial experience has been reported in the use of such low-aluminum alloys.

This information, "whose incomplete character cannot be too strongly emphasized," is reviewed, briefly, for the information of producers and consumers of zinc die castings. There is no assurance at present that properties on which tests are not yet available may not interfere with the use of these alloys in some instances, at least, just as difficulties with casting properties have already come to light as commercial trials have followed the laboratory tests.

With respect to laboratory tests, Apex Smelting Co. has reported a considerable amount of data from which is taken the following comparison of these two alloys:

	A.S.T.M. Alloy XXV	Low Aluminum Substitute
Al, %	4.1	1.5
Cu, %	1.0	1.0
Mg, %	0.03	0.03

	Alloy XXV	Substitute Alloy
Tensile strength, as cast, psi.	44,300	40,400
Tensile strength, 10-day, 95°C. water vapor, psi.	34,500	28,000
Elongation, as cast, %	5.3	5.7
Elongation, 10-day, 95°C. water vapor, %	3.7	5.7
Charpy impact (avg. gate and vent) as cast, ft.-lb.	38.5	34.0
Charpy impact (avg. gate and vent) 10-day, 95°C. water vapor, ft.-lb.	6.7	12.8
Dimensional change on 6-in. bar, 10-day, 95°C. water vapor, in.	−0.0002	−0.0006

The New Jersey Zinc Co. report that as far as their tests have gone, they have obtained substantial checks on the above results except in respect to dimensional change. Known slight differences in analysis and possible differences in casting practice will probably explain this discrepancy when a complete study is available.

The New Jersey Zinc Co.'s results indicate some difference between alloy XXV and the 1.5 per cent aluminum alloy but the results are too incomplete to say whether the difference will be objectionable. They further report that to retain as favorable a comparison with the specification alloy as above, a low-aluminum substitute for alloy XXIII (4 per cent Al, 0.3 Mg) must contain at least 2.0 per cent aluminum.

Attention is drawn to the following points on which information is lacking or incomplete: (1) The range of permissible die and metal temperatures has not been determined. Some alloys of this type have been previously encountered which had a too narrow permissible range for commercial operation. (2) Creep resistance, which is a property of governing importance in many uses of zinc die castings, particularly where elevated temperatures are encountered, has not been determined. (The New Jersey Zinc Co. hope to have rapid preliminary tests available on this within a few weeks.)

Varying reports have been heard concerning the experiences of die casters attempting to use these alloys. Some difficulties have been encountered due to the difference in solidification shrinkage characteristics and greater hot shortness of the lower aluminum alloys. In some instances, these difficulties have been overcome by increasing the aluminum content from 1.5 to 2 per cent.

To what extent these difficulties can be overcome by attention to die design and casting practice is not yet known. In spite of the probability that a large number of castings can be successfully made with these alloys, the available evidence indicates that due to the above difficulties some castings cannot be produced successfully with alloys of reduced aluminum content.

Aeronca Aircraft Corporation

A number of YO-58 Aeronca Defender airplanes have been ordered by the Army, according to releases from Aeronca Aircraft Corporation. The order was the outgrowth of Army experiments with light airplanes during recent field maneuvers, when the feasibility of using light airplanes for messenger and liaison work became evident.

Boeing Aircraft Company

Boeing progress in the past twelve months since the first quantity contract for the B-17E Flying Fortress was awarded has been reported by the Boeing Aircraft Company in releases describing the B-17E and the expansion that has taken place in Boeing manufacturing facilities.

THIS UNIQUE WING...

mathematically developed by Fairchild engineers, for the first time gives a full cantilever, low-wing monoplane the desirable stall and lateral control characteristics of the biplane. In the Army's PT-19 it makes possible the first safe primary training in ships of combat type.

Fairchild's position in the aircraft industry, as one of the smaller companies with the most advanced engineering organization and equipment, makes possible the successful pioneering of which this wing is but one example.

FAIRCHILD ENGINE & AIRPLANE CORP.

30 Rockefeller Plaza, New York
Hagerstown, Md. · Farmingdale, L. I.

Boeing's active floor area at Seattle has been enlarged from 800,000 to 2,400,000 sq. ft. and a new plant of 380,000 sq. ft. has been erected at the company's Wichita, Kansas, division, for participation in the Flying Fortress program. All of these facilities are now in active production, and the new Wichita plant is being further enlarged to 1,700,000 sq. ft.

In its expanded Seattle plant, the company has installed during the past year more than $9,000,000 worth of modern production machinery, as well as assembly jigs, dies, machine fixtures and handling fixtures, all designed for quantity production. The Boeing tooling department has designed and manufactured some 40,000 such jigs and tools since a year ago, to fit the requirements of the new volume production. Besides the parts and subassemblies being produced with this equipment, the B-17E's embody subcontracted parts made for Boeing by 55 different manufacturers and standard parts and equipment furnished by 193 other companies.

Preparations are being rushed for the quantity production of the new Flying Fortress by the recently-arranged Boeing-Douglas-Vega joint production "pool." This cooperative arrangement provides for the manufacture of completely assembled identical planes at the new Long Beach plant of Douglas Aircraft Company and the Burbank plant of the Vega Airplane Company, subsidiary of Lockheed Aircraft Corporation, as well as at the Boeing plants.

The four-engine, long-range B-17E, first test-flown on September 5, is a new and advanced version of the familiar Boeing Flying Fortress type which is now in service with the U.S. Air Corps and the Royal Air Force. The B-17C, an earlier version, known in Great Britain as "Fortress I," is the type that recently opened a new phase of aerial warfare when it introduced extreme high altitude bombing operations in the European War.

The new bomber is approximately five feet longer and has greater gross weight and greater fire power than earlier Fortresses. Power turrets both on the top and bottom of the fuselage and a stinger turret in the tail offer resistance to attack from any direction. Enlarged horizontal and vertical tail surfaces, similar in appearance to those of the Boeing Stratoliner, provide for the increased size and weight.

Cambridge Instrument Company, Inc.

A new instrument for production testing of the permeability of fabrics inflated with Hydrogen, Helium, Carbon Dioxide, etc., has been announced by the manufacturer, Cambridge Instrument Company, Inc. The Fabric Permeameter quickly determines the rate of permeation through the fabric by utilizing the thermal conductivity method of gas analysis. Permeation rate is indicated in terms of "liters per square meter per 24 hours" of the retained gas.

In addition to determining the rate of diffusion of Hydrogen and other gases through balloon fabrics and other materials, the Fabric Permeameter can measure lateral diffusion and leakage at seams. It also makes possible the testing of the effectiveness of various "dopes" with which the fabrics are treated.

Carboloy Co., Inc.

Data released by Carboloy Co., Inc., on production at the Consolidated Brass Company plant in Detroit indicate that the use of standard Carboloy tool bits, the development of new types of tool holders in which the bits are mounted and the use of carbide drilling tools have yielded manifold production increases in the manufacture of brass fittings.

The new holders make it possible for each holder to perform several operations for which two or more tools or holders were formerly needed. The drills are built into the holders along with up to six standard tool bits and are used for drilling cored holes at the same time the exterior sections of certain fittings are turned or faced.

E. I. du Pont de Nemours and Company

A new type of neoprene synthetic rubber, recently announced by the du Pont Company, is said to offer improved resistance to the effects of sub-zero temperatures. Called Neoprene Type FR, it combines the desirable qualities of natural rubber at low temperatures and the oil-resistant qualities characteristic of all types of neoprene.

Vulcanizates of the new synthetic are more resilient, take lower compression set and have greater resistance to swelling by water than those of other neoprenes. In these respects its properties are said to equal or even exceed natural rubber. The material is supplied in the form of preplasticized, milled sheets and has a lower specific gravity than any other neoprene, — 1.15.

Many new types of airplanes are designed to operate at extremely high altitudes where temperatures as low as −70° may exist. In many of these applications, the elastometer used must possess excellent resistance to sunlight and oxidation in addition to resistance to low temperatures and oils. Neoprene Type FR is claimed to fill these requirements.

Everel Propeller Corporation

According to releases from the Everel Propeller Corporation, Baltimore, the Everel propeller has been approved on the Lycoming geared 75-hp. engine. To meet the need for this type of propeller on engines of the lower horsepower bracket, Everel has now developed propellers with automatic variable pitch in ranges extending from 65 to 300 hp.

The Everel principle of automatic variable pitch actuation, as used on the Lycoming geared "75" engine, is based on the establishment of equilibrium of the aerodynamic forces and the centrifugal force acting on the propeller blades. With the balance thus established, constant engine r.p.m. and corresponding horsepower output at fixed throttle setting is obtained by the use of the Everel propeller regardless of the attitude of the plane.

The power, however, may be varied by the pilot by simply changing the throttle setting and the propeller will again hold the engine to a fixed r.p.m. at the new setting. Thus full engine power at rated r.p.m. is always available for take-off, climb or level flight. This constant r.p.m. feature is especially valuable in maneuvers or acrobatics and overspeeding of the engine in a dive is prevented.

Tests have shown this constant speed propeller to improve take-off distance and rate-of-climb in some instances as much as 30 per cent, as compared with fixed pitch propellers, without sacrifice of level flight top speed. Likewise more efficient and economical engine operation results in fuel saving and increased cruising radius.

As compared with controllable pitch types, the Everel principle makes propeller pitch alteration completely automatic with no manual control, thereby eliminating the possibility of pilot error and increasing the safety factor. At the present time Everel automatic var able pitch propellers are available for installation only to the military services and airplane and engine manufacturers.

Harris Products Company

One of two new products announced by Harris Products Company, Detroit, is a line of low-cost tube fittings, called Sealflex, which permit wide angle flexibility under high pressures. The fit-

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- ☐ T-17 (Fabrication, Seamless Pipe, Tubing)
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tings provide flexibility for rigid tube of up to 10° included angle, yet eliminate necessity for special flexible tubing and reduce sound transmission in lines. They permit rapid assembly without special tools for the lower capacity uses.

A new development in Harris Products' Torflex line is a flexible coupling which can serve as a connecting medium for oil lubricating lines as well as a coupling capable of transmitting torque and compensating for parallel or angular misalignment. It reduces noise and vibration and smoothes out power impulses.

The Glenn L. Martin Company

From the manufacturer of the Navy's XPB2M-1, largest flying boat in the world, comes new information on the characteristics of the airplane and the nature of tests now being performed on its wings. It is a long-range patrol-bomber capable of flying across the Atlantic and back again without a stop, or of patrolling vast areas of sea at high speed, able to base anywhere, ready to carry tons of bombs. Its wings spread 200 ft. from tip to tip; its two-deck hull measures 117 ft. in length; its normal gross weight is 140,000 lbs.; its power is four 2,000 hp. Wright Duplex Cyclone engines. These are the only figures released so far.

No announcement has been made as to when the craft will fly, but it is now in its final stage of construction, with installation work its chief unfinished increment. Interesting data has been released on the unusual manner in which the wing-proof test is being conducted.

The object of this test is to prove, by application of loads to the entire wing, tail and hull of the airplane, that the structure will be capable of safely withstanding the greatest loads that will ever be applied in flight. In the critical flight condition which is to be simulated in this test, the load on the wing is upward and slightly forward and is balanced by the downward inertia loads of the entire airplane, plus a balancing downward load on the horizontal tail surface.

The simulated upward air load on the wing is applied by a group of structural steel levers bearing on the undersurface of the wing. These levers are interconnected into five separate groups on each side of the airplane, each group being loaded from above the wing by a hydraulic tension jack.

The downward inertia forces of the hull and its contents are simulated by ballasting the fuel tanks with water and applying additional downward loads by jacks connected by special fixtures to four points along the length of the hull. The downward load on the tail is applied by a steel fixture attached to the hull at the stabilizer connection points.

Before the test loads are applied, the airplane rests solidly on two pedestals, a steel one under the hull below the front of the wing and a wooden one at the second step of the hull. When the test loads are applied, the balance of loads is such that the airplane is almost freely suspended above these pedestals under the same forces which hold it when in the air. Only sufficient unbalance is allowed to make certain that the plane does not move upward and become completely disengaged from its supports. The net result is that the airplane is practically in a flying condition so far as loads are concerned.

Typical data descriptive of the airplane and test are as follows: Test Load Factor is 2.79 g. Total test load applied upward on the wing is 250,000 lbs., causing a bending moment of 69,000,000 inch pounds at the root of the wing. Total downward load applied on tail is 23,400 lbs. Total downward load applied to hull is 123,000 lbs., in addition to water ballast in the fuel tanks.

The test loads are applied by hydraulic jacks and traction dynamometers capable of exerting up to 100,000 lbs. force. In order to supply the necessary reacting points for the tremendous loads applied by these jacks to the wing and hull, a jig structure containing 310,000 lbs. of structural steel has been built around the airplane. The overall dimensions of this structure are (1) span, 210 ft., (2) height, 44 ft., (3) depth, 33 ft.

This structure houses the $^3/_8$ mile of walkways built around the airplane for use of operating and inspection personnel during the test. These walkways alone contain over 90,000 lbs. of lumber. To sustain the weight of the steel and wood fixture, special steel plate footings, containing 10,000 lbs. of steel, were built into the concrete floors of the building.

Due to the magnitude of the test, a specially trained crew of 150 engineers and technicians is necessary for operation of the equipment, and observation of the behavior of the airplane under load. All of these men are under the direction of one control engineer. The problem of providing the necessary coordination for this group is solved by a combination of colored light signals visible to the entire operating force from all points of the test and a public address system with 10 outlets placed uniformly around the test fixture, both items being operated from the control engineer's desk. Further precision of control is obtained by dividing the loading jack operators into small groups under the direction of loading foremen, all of whom are in constant communication with the control engineer by an interphone system.

The deflection of the airplane structure will be measured by use of 125 deflection scales and gages placed throughout the wing and hull. The deflection at the wing tip will be about 70 in. under full load. Overall deflection of the wing and hull will be measured by surveyor's levels and transits, of which twelve are required, on scales attached to the airplane structure.

Stresses in the wing and hull structure will be measured at 102 strategically located points by means of metalectric strain gages. The installation of these gages is such that all of them can be controlled from the two central strain gage stations, one under the wing and one in the hull.

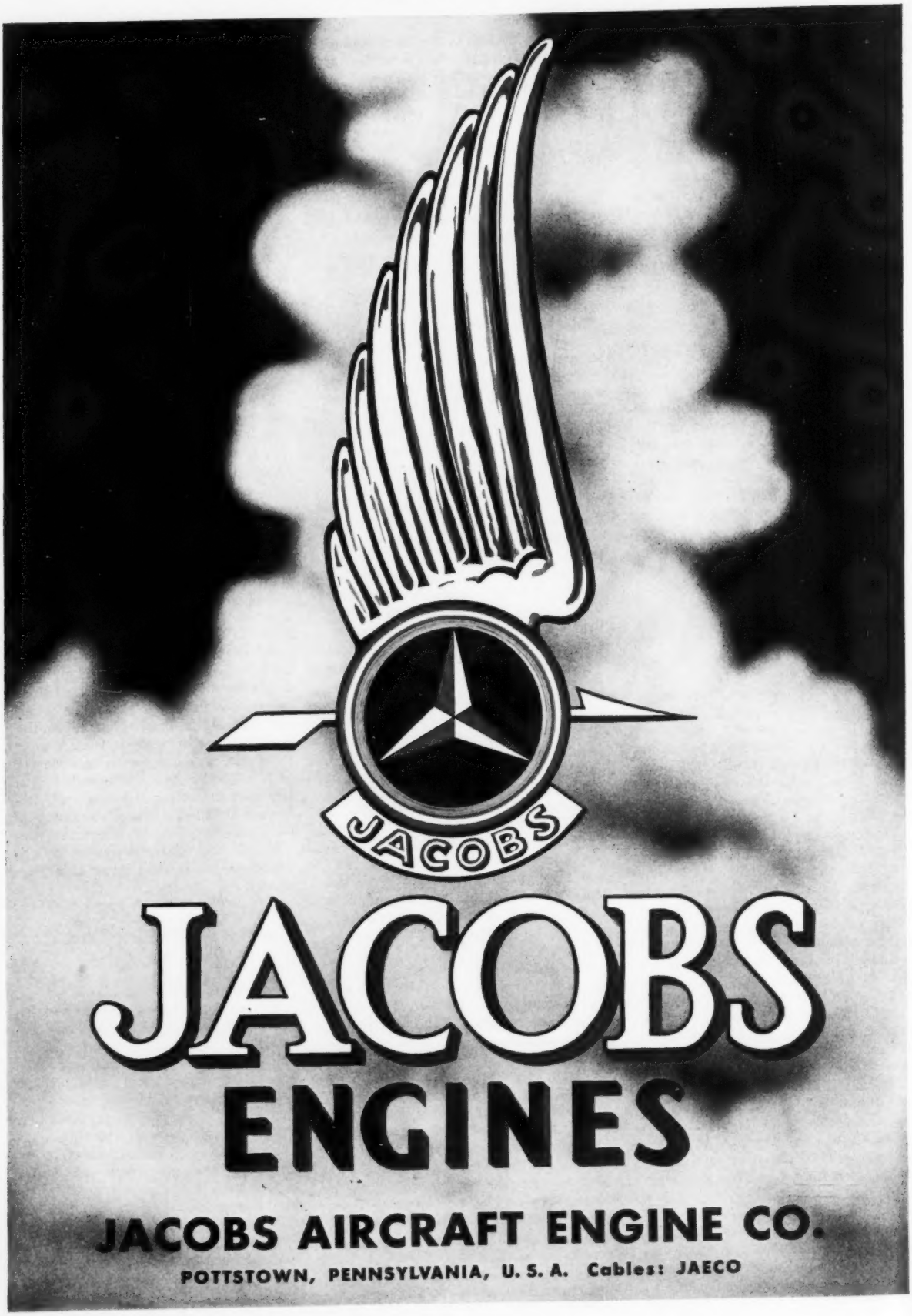
The test section of the Engineering Department has been working on the design of the test fixture and the load applying devices for the past 18 months. Every step of the test has been so carefully planned that the actual test, the final objective of all this tremendous preparation, will take only a few hours.

When the test is completed, the following information will have been gained: (1) Proof that the structure is capable of withstanding the worst combination of loads it will encounter in flight. (2) A demonstration of the physical appearance of the airplane under the worst service loading condition. (3) Minor weaknesses, such as excessive skin wrinkles, will be found and suitably reinforced. Due to the great number of parts, it is impossible to predict in advance the behavior of each and test results are depended upon for small corrections to design (4) Deflection and stress data will be obtained for comparison with the engineers' predictions, and future design procedure will be aided by the knowledge thus gained.

Longines-Wittnauer Watch Co., Inc.

A unique flight calculator watch, which tells time, time out, speed and distance, has been made by the Longines-Wittnauer Watch Company for Major Lester D. Gardner, Vice-President of the Institute of Aeronautical Sciences. The designs for the calculating features of the watch, made by Major Gardner, were sent to Switzerland where the hour, minute and speed indications were engraved by expert dial engravers. So far as is known it is the only watch of its kind ever made.

Around the center watch dial are two rotatable outer rings. The inner of these two rings is rotated by a separate winding stem; the outer ring is rotated by hand. To calculate elapsed time the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arrow M on the inner ring is set opposite the minute hand; and the arrow H on the outer ring opposite the hour hand of the watch, at the beginning of the flight. From these "fixes" the elapsed time of a flight is readily calculated.

The two rings are engraved with standard flight calculation scales. Distance, speed, and elapsed time can be determined when any two of the elements are known. The utility of the watch is enhanced by a stop-second, flyback action which can be used for continuous or intermittent timing, or for second-setting.

"I wanted a watch which would be more useful while flying," Major Gardner said, "but could find none which could have the calculator feature incorporated until I saw the special Longines-Wittnauer double movable bezel type. While this watch requires great precision in operation, I believe that it is a type which will be of such utility that larger wrist watches can be made to incorporate this feature and render a helpful service to pilots who wish to have a flight calculator always available."

New Method Steel Stamps, Inc.

A new type of inspectors' stamps intended to facilitate identification of parts has been announced by New Method Steel Stamps, Inc. To meet conditions arising from triple-shift operation in defense industries, the new stamps are numbered from 1 to 99, the numbers in each shift or group being enclosed in borders of an identifying shape. Thus, identical numbers with different borders can be assigned to inspectors or operators doing identical work on different shifts. In this way it is possible to identify the operator making the part as well as to distinguish night from day shift operators or inspectors.

Pan American Airways System

In connection with its recent application to the Civil Aeronautics Board for authority to institute service over a new transocean trade route linking the North Atlantic seaboard with West Africa, Pan American Airways has released data on its plan to expedite delivery of military aircraft to the Middle East.

The national defense aspects of the route are indicated in its projection to the Belgian Congo, with airline connections to the Union of South Africa, both of which areas are among the primary sources of raw materials for the United States defense production. At the present time only infrequent and limited surface transportation is available to these strategic trade and defense areas, and mail and transport time on the best available schedules requires three to six weeks.

The plan is to establish regularly scheduled operation of a transatlantic air service for passengers, mail and express between New York and/or Baltimore and Leopoldville, in the Belgian Congo—the first details with respect to the actual routes to be set up under the plans of the Government announced by the President.

The route is expected to extend from New York to Puerto Rico and Trinidad, thus providing a direct service to these two principal U.S. defense bases in the eastern Carribean. From Trinidad it is to continue south, across the Amazon and down the east coast of Brazil to

The Gardner-Longines flight calculator watch.

Natal, thence across the South Atlantic to Monrovia, Liberia. From Liberia, it is to continue along the Ivory and Gold Coasts by way of Togoland to Lagos, in Nigeria, thence to the trade port of Leopoldville, on the Congo River in the Belgian Congo. Provision is being sought for the use of Bathurst, British Gambia, as an alternate port in West Africa.

From Leopoldville connections will be made with Belgian and South African airlines serving the interior of the Congo and providing direct service to the Union of South Africa as well as to the important British colonies of Uganda and Tanganyika.

The Boeing 314-A type of four-engined Clipper, as currently used by Pan American on its North Atlantic and Transpacific services, is to be used over the route between New York and the Belgian Congo. No details with respect to schedules or airway or airport facilities to be established were revealed.

The establishment of the South Atlantic service will provide the first direct service between the United States and strategic military and commercial ports in West Africa. It would also serve as the transport means for supplying the ferry operation with spare parts and materials required for its maintenance and for the return transportation of pilots who will be employed in the ferrying of aircraft from the United States to the front in the Middle East.

Progressive Welder Company

To facilitate resistance spot welding inside of deep assemblies, a variation of its pedestal welder has been developed by Progressive Welder Company, according to company releases. The deep-throat welder has its lower arm built of heavy tubing and fitted with a replaceable adaptor for the lower electrode. The construction makes unnecessary the supporting of the lower arm by means of the usual braces, due to its inherent rigidity. Elimination of the usual braces, in turn, makes possible sliding deep assemblies over the arm to full throat depth.

The upper arm, carrying the upper electrode and gun assembly, is braced in the conventional manner. Both upper and lower arms are designed so that they may be adjusted in or out to increase or decrease throat depth as may be required. To weld a part such as a cylindrical tank, the unit is slipped over the lower arm to desired location for welding, the unit resting on the lower electrode. Pressing the control actuates the hydraulic welding gun, bringing the upper electrode down against the part to be welded, and initiating the weld cycle.

Features of the deep throat welder are described as being elimination of frequently troublesome flexible shunts; positive hydraulic or air-hydraulic pressure at the electrodes; non-magnetic head construction, cutting induction losses; straight-line movement of the upper electrode; provision of non-flicker pressure switch; and positive cooling circulation. The lower arm is adjustable for height as in other Progressive welders.

A line of Progressive "portable" welding machines with built-in transformers and designed for suspension from monorails has also been introduced. While they may be used for much of the work now done on pedestal welders, they are said to have particular advantage in such applications as spot welding of large units requiring clearance from the ground under the welding arms, or of heavy units; spot welding of parts on a conveyor; spot welding assemblies in several jigs in one department, requiring movement of the welding equipment; pinch welding of spots not easily accessible with gun type welders due to throat limitations; and jobs which can be handled most effectively by a unit suspended from a swinging or traveling crane.

10,000 MILES ACROSS TRACKLESS WASTES OF WATER AND SKY!

Yet Pan American's new Boeing B-314 flies unerringly to island stops no bigger than a Kansas farm.

The skyway sign that points the route is the new Kollsman Direction Indicator.

Still so new as to be called "revolutionary", this compass with the vertical dial and reference index settable to any course, brings a new simplicity to compass reading.

Today it guides Pan American's newest, largest clipper on its long Trans-Pacific hop. It is also standard equipment with other major airlines, the Army and the Navy.

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LET'S GO! U.S.A. KEEP 'EM FLYING!

Frank Rieber, Inc.

A new portable phonographic recording and playback instrument, suitable for use by airports and airlines, has been announced by Frank Rieber, Inc., consulting and manufacturing engineers, Los Angeles. Installations have been made in a number of airports, where it is used to monitor the two-way conversation between pilot and base during landings and take-offs. It also serves for a permanent word-for-word monitoring of an airplane's flight.

The instrument is called the CGS Recorder, due to the fact that the mechanism operates in-to-out on the record at constant groove speed. At a speed of 3.85 in. per second, a 12-in. disk lasts 62 minutes, and a 7.7 in. per second, 31 min. The operating speed is gaged by the fidelity required. CGS employs the embossing principle and makes no shavings or dust. The disks may be used on both sides. Filed like letters, more than 40 disks require but an inch of filing space.

The unit can be used wherever a 110-volt circuit is available and may be operated by remote control; a special pre-amplifier provides for distant pickup. It can be equipped to start the instrument automatically at the sound of the voice and stop at a given interval after speaking ceases. Recording and playback of previous recordings may be accomplished simultaneously.

Republic Aviation Corporation

A new and novel photo-reproduction process, developed by Republic Aviation Corporation, is responsible for much of the success in cutting the time between engineering and the assembly line, according to company releases. This method of reproduction has proved a vital time-saving factor in the production of patterns and templates for shop fabrication and has enabled Republic to eliminate a serious bottleneck in production.

Under the Republic patent-pending process, the original layout is made on a sheet of transparent or translucent plastic material which has previously been spray-coated with an opaque covering. The layout is worked by scribing through the opaque covering, exposing the clear plastic surface underneath. Lines thus formed constitute the master layout which is used as a master negative. Revision can be made or errors corrected by simply spraying over the portion to be changed with the same opaque material.

After once having been inspected, this master negative can be reproduced as many times as required; each copy being the exact duplicate of the original. This also eliminates the possibility of accumulative error.

The material onto which the layout is transferred can be aluminum, steel, wood, paper, etc., of any thickness desired. These materials are coated with a light-sensitive emulsion, dried and stored in a dark room.

At this point the Republic photo-reproduction process steps into its time-saving methods. The master negative is placed in a large vacuum printing frame, in contact with the sensitized material and exposed to light for a matter of seconds. It is then developed in the customary photographic manner.

Contact printing on metal. Part of the new photo-lofting process recently installed at Republic Aviation Corporation.

Ryan Aeronautical Corporation

The largest single contract ever awarded for the manufacture of aircraft engine exhaust systems has just been given the Ryan Aeronautical Company, San Diego, according to T. Claude Ryan, president, who has indicated that the new business increases by approximately $2,000,000 the backlog of orders in Ryan's manifold division. This latest order calls for the production of thousands of exhaust system units, all of which will be equipped with the patented ball and socket universal joint developed and manufactured exclusively by Ryan.

Taylorcraft Aviation Corporation

On September 1, Taylorcraft Aviation Corporation turned over its entire production of light aircraft to manufacture for specific national defense needs. The announcement was made in a recent bulletin to company distributers, issued with the following comment:

"Materials, particularly aluminum, are available only for airplanes which can contribute to the defense program. The demand for Taylorcrafts to participate in the pilot training program, plus those aircraft which will be needed for the greatly expanded civil necessities activities, will in all probability exceed our production capacity with limited materials.

"The importance and value of light airplanes in national defense is becoming generally recognized and there is every reason to believe our industry will prosper through its contribution to the national welfare. We must do our part to see that light airplanes are utilized to the fullest extent. Therefore we urge your complete cooperation in helping to expand approved activities."

The bulletin exhorted distributers to devote sales efforts toward developing and extending the programs which utilize light airplanes for approved defense purposes. Those designated were: Civilian Pilot Training Program schools, airline instrument training schools, other C.A.A. approved flight schools, Home Guard units, pipe line patrol, state and city police, power line patrol, forest fire patrol, flood dike patrol and experimental projects approved by the Civil Aeronautics Administration.

Asking the aid of distributers in taking the initiative in organizing local owners of private airplanes as Home Guard units, the bulletin indicated that such assistance would not only be contributing toward national defense but would also be helping materially to protect the future interest of private flyers. All future orders for Taylorcraft airplanes require that a notarized affidavit be furnished showing that the craft will be used for approved defense purposes.

Universal Air Freight Corp.

The opening of a new Universal Air Freight depot at La Guardia Airport, New York, was recently announced by the company. Located in the land plane administration building, shipments are received in the new depot and routed *via* the first airline schedule for destination. Other depots are to be opened at other key airports throughout the country in the near future. At the present time the company covers 155 destination cities in the United States.

Gill Robb Wilson, director and aviation consultant for the company, said in connection with the opening of this direct airport service for shippers that further expansion of Universal Air Freight's operating facilities would be undertaken as rapidly as called for by the American shipping public's demand for low cost and fast operations in freight forwarding service by air.

(*Continued on page 45*)

TOOLS

"Give us the tools . . ."—Winston Churchill

Give us a medium bomber, with heavy striking power . . . a heavily armed bomber, that can serve as a twin-engined fighter . . . a bomber that can travel, too, on missions of long-range reconnaissance. These R. A. F. tactical requirements are met by the new Martin "Baltimore" Bombers—now being delivered in numbers to Britain. The Glenn L. Martin Company, Baltimore, Maryland, U. S. A.

Martin
AIRCRAFT

Builders of Dependable *Aircraft Since 1909*

Government Publications

(*Continued from page 22*)

They were a steel plank design, Irving grid with slipring connectors and a bar grid with wedge connectors.

A general description of improvements made on existing types is given together with an account of the methods developed for camouflaging the improvised fields and conclusions on the carrying capacity, portability and traction of the various types of landing mats. *Air Corps News Letter*, August 1941, pages 5, 16.

They Glide Through the Air. Major Fred R. Dent, Jr. One of the first six Army pilots to be sent to Elmira, N. Y., to study glider technique gives an account of the three weeks of intensive work done by this pioneer group under the direction of John Robinson and other prominent soaring experts. Their studies included basic familiarization in a Franklin single-place utility glider and, later, advanced work and soaring in a two-place Schweitzer sailplane. Winch, car and airplane towing were used during their training.

The officers were frequently assigned to the 220-hp. Continental engined Waco biplane, which was used to tow the sailplanes. The difficulties of this type of flight, the feeling that the airplane was constantly on the verge of stalling and the tendency for the attached glider to offset the action of the elevators when it got above the tow craft are explained.

The writer also gives an account of a soaring flight inside a cloud in the Schweitzer with John Robinson. The sailplane climbed from 3,700 to 15,000 ft., picked up ice and gave the writer, a pilot rated to command a flying fortress, some new angles on instrument flying. *Air Corps News Letter*, August 1941, pages 3, 6, 10, 24, 2 illus.

Office for Emergency Management

Priorities. A revised edition of the Priorities Critical List as of August 11, 1941. The list consists of about 300 items and classes of items and is broken down into a section for finished products and a section for raw materials. Items which have been placed under industry-wide control by the Priorities Division are so marked. The remaining items are subject to priority regulation only in the sense that Army and Navy orders may be assigned preference ratings so that delivery dates may be met. *Defense*, August 26, 1941, pages 10, 11.

U.S. Office of Education

Engineering Science and Management Defense Training Courses. General information on courses in engineering sciences, management and other subjects allied to production for national defense is given in this bulletin published by the *Engineering Sciences and Management Training Division, U.S. Office of Education.* The courses are being conducted at the Massachusetts Institute of Technology, Harvard, Northeastern and Boston Universities, Tufts and Boston College. Typical subjects offered are advanced engineering drawing, aerial mapping, production control, shop mathematics, tool design and time and motion study. Entrance requirements vary from high school graduation only to engineering and science degrees.

Air Ministry of France

Étude sur l'Onctuosité des Lubrifiants—Deuxième Partie (Study on the Lubricative Quality of Lubricants—Part 2). Fernand Charron. A previous study on friction, appearing in No. 131 of these publications, led to the development of a device for measuring the coefficient of friction between two lubricated metals, or in other words for the determination of the degree of oiliness of a lubricant.

The device is described in Part 2. It is used by the Académie de l'Aeronautique and by various manufacturers of lubricants. After certain improvements, the device could be commercialized. There are possibilities for the use of this "oiliness meter" at various conditions, such as the systematic modification of the pressure of the contacting bodies, the nature of the metals, and above all the temperature of the lubricating oil, as the examination of the lubricative qualities at high temperatures is very important.

The oils tested were furnished by the Aeronautical Technical Service. Castor oil and olive oil were added for the tests. *Publications Scientifiques et Techniques du Ministère de l'Air*, No. 169, 1940, pages 1–26, 2 illus.

Controle de la Température de Couleur de Lampes à Incandescence Destinées à des Feux de Signalisation (Determination of the Color Temperature of Signal Lights). Maurice Rolleau and Lise Heymann. A report describing the application of color temperature characteristics of incandescent lamps to aircraft position and signal lights.

The experiments indicated that the combination of ordinary incandescent lights with colored filters is inadequate for perfect recognition. The combined necessity for maximum range and clarity required not only selected filters but specially prepared luminous sources. The variation of the trichromatic coordinate of the colored source with the color temperature of the lamp demonstrated the importance of this temperature.

The report describes a simple instrument used for measuring color temperature. Its operation and interpretation are outlined and some of the practical uses to which it can be put are indicated. *Publications Scientifiques et Techniques du Secrétariat d'État à l'Aviation*, B.S.T. No. 92, pages 1–21, 5 illus.

La Fonderie dans la Construction Aeronautique (Castings in Aeronautical Construction). R. de Fleury. A study of the methods used in making aluminum and magnesium castings for use in aircraft construction. Details of currently used casting methods are provided and supplemented by many examples, giving step-by-step directions to foundrymen in order to eliminate guesswork. *Publications Scientifiques et Techniques du Secrétariat d'État à l'Aviation.* B.S.T. No. 93, 1941, pages 1–68, 9 illus.

From the Industry

(*Continued from page 43*)

Weltronic Corporation

A series of resistance welding heat controls, designed to cover a wide range of applications of such units in resistance welding operations, has been announced by the Weltronic Corporation. Known as Weltronic Series 50, the group consists of three basic models, the 50-Y unit, designed for accurate current control for single welds; the 50-W unit, a multiple heat control designed for either pulsation or multi-spot welding; and the 50-XX which is an automatic heat rise control for either single-spot or pulsation welding.

Whiting Corporation

The aviation department of Whiting Corporation, Harvey, Illinois, has announced the development of a new dolly for handling and storing radial engines of all makes and sizes. Especially designed to permit easy access to the engine and to take up a minimum amount of floor space, the unit is built to slip between the legs of the Whiting engine hoist and thus bring the engine in position for easy installation.

"ARMY BOUND" by John Hammer

ARMY BOUND . . . With a regularity which reflects the high achievements of the aircraft industry, powerful Republic Interceptors head up and away to join the Army Air Forces. At substratosphere altitudes, Republic squadrons are serving the nation well. Republic Aviation Corporation, Farmingdale, L. I., N. Y., U. S. A.

REPUBLIC AVIATION

REPUBLIC AVIATION

Library Accessions

(*Continued from page 29*)

Blackie and Son Limited, London, 1940; 451 pages.

A survey of the construction, applications, and operation of all types of internal combustion engines, with descriptions of engines representative of each type.

Junkers und die Weltluftfahrt (Junkers and International Air Service), edited by F. A. Fischer von Poturzyn; Richard Pflaum Verlag, Muenchen, 1934; 183 pages.

History and development of the Junkers Works and the use of their transport planes throughout the world. Chapters on Junkers Diesel engines and records made with Junkers equipment are included.

Der Metallflugzeugbau (Metal Airplane Construction), by C. Walther Vogelsang; Richard Carl Schmidt & Co., Berlin, 1938; 160 pages.

An introduction to the construction, design, and production of metal airplanes.

The Next War, by L. E. O. Charlton; Longmans, Green and Co., London, 1937; 81 pages.

An airman examines the problem of aerial warfare from the practical and technical standpoint and demonstrates the vulnerability of England to sudden attack and the completeness of its devastation.

Rigging and Airframes; A Manual for Riggers and Students, by J. Campbell Corlett; Sir Isaac Pitman & Sons, Ltd., London, 1936; 116 pages, 5*s*.

A general outline of the fundamentals of metal aircraft construction and maintenance, presented in simple language for apprentices, mechanics and student pilots.

Strength of Materials, by Arthur Morley; 9th edition, Longmans, Green and Co., London, 1940; 571 pages, 15*s*.

The revised edition of a standard textbook for engineering students, with added material on fatigue, criteria of elastic strength, creep, metallurgical developments of ferrous metals, and methods of testing.

The Technology of Magnesium and Its Alloys, a translation from the German by the technical staffs of F. A. Hughes & Co. Ltd., and Magnesium Elektron Ltd., of *Magnesium und Seine Legierungen* compiled by Adolf Beck; F. A. Hughes & Co. Ltd, London, 1940; 512 pages, 30*s*.

A reference book on magnesium and its alloys, including data on sources of raw materials, production, physical and mechanical properties, manufacture, processing and uses.

Trente Ans Service de l'Aviation; Les Avions Louis Breguet de 1908 à 1938; Imprimerie Henri Dieval; Paris, 1938; 44 pages.

An historical sketch of the airplanes designed and built by Louis Breguet, outlining some of the many famous flights achieved with these planes.

Principles of Mathematical Physics, by William V. Houston; McGraw-Hill Book Company, Inc., New York, 1934; 265 pages.

A college text which gives the student a working knowledge of the fundamentals of mathematical physics rather than an exposition of the theories of physics. Details of the theory are left for the student to fill in by solving problems which form an integral part of the text.

Proceedings of the Fifth International Congress for Applied Mechanics, edited by J. P. Den Hartog and H. Peters; John Wiley & Sons, Inc., New York, 1939; 748 pages.

Papers on the mechanics of solids, elasticity, and properties of materials, mechanics of fluids, and dynamics.

News Review

(*Continued from page 6*)

first synthetic rubber plant in this country, a project of the United States Rubber Company.

September 1. Two Russian seaplanes, carrying an air commission of 47 men, arrived at Nome, Alaska, en route to Washington.

September 2. The government of Ecuador suspended the operations of the German-controlled Sedta airlines and granted exclusive transport rights to Pan American Grace.

September 3. A British radio report, quoting a Moscow dispatch, stated that the first British and American-built aircraft had arrived in Russia.

September 5. The Office of Production Management announced that 1,854 military airplanes had been delivered in August, an increase of 394 over the best previous month and a 300 per cent increase over August 1940.

September 5. Floyd P. Odlum, New York financier, was appointed head of the newly created contract distribution division of the OPM.

September 6. Edmund T. Allen test flew the Boeing B-17E, newest of the Flying Fortress types. Developed from the established model, the new craft is equipped with power turrets, supercharging equipment for high-altitude flight and additional armament on the sides of the fuselage and in the tail.

September 6. The first of a fleet of Consolidated flying boats, sent to reinforce the Dutch air force in Java, arrived after a seven day flight from San Diego. The delivery, made by a five-man Dutch crew followed the Pan American route from Honolulu to Guam, Wake, thence to the East Indies.

September 7. Bernt Balchen, noted Norse aviator, was commissioned a captain in the specialists' reserve section of the Army Air Corps.

September 8. The Civil Aeronautics Administration announced that the Civilian Pilot Training Program would be carried out in more than 500 schools and colleges this fall.

September 8. It was reported that 16,000 civilian observers would man aircraft warning stations during maneuvers between the 2nd and 3rd Armies in Southwest Louisiana.

September 9. Pan American Airways airport experts arrived at Monrovia, Liberia, to begin construction on a $1,000,000 air base for the South Atlantic ferry route.

September 10. Dr. N. Wyman Storer, of the University of Kansas, speaking at a session of the American Astronomical Society at Williams Bay, Wisconsin, demonstrated a celestial sextant for instantaneous determination of position. The instrument permits the simultaneous observation of two stars at once and permits determination of position without further calculation.

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WESTON

Aircraft Instruments

R.A.F. Slang

From English publications, from conversations with R.A.F. men here on duty for convoy, ferry and instruction, and from Americans who have heard the expressions and brought them home, this nomenclature has been gathered. Definitions of slang terms can be given only broadly as some have several meanings.

Ack-ack. Originally the rapid-firing light anti-aircraft guns; now applied to anti-aircraft of all calibers.
Ackemma. Aircraftsmen (from A.M., air mechanic).
Archie. Anti-aircraft shell.
Astro hatch. Opening in top of airplane fuselage for shooting stars with sextant.
Astro-dome. Transparent calibrated dome for shooting stars without exposure to airstream.
A.T.A. Air Transport Auxiliary. Ancient and Tattered Airmen. Always Terrified Airmen.
Ataboys. Men A.T.A. pilots.
Atagirls. Women A.T.A. pilots.
Avoiding action. Violent deviation from straight flight to avoid enemy fire.
Bag. Enemy airplanes brought down in a single day's action.
Balloonaticks. Those who man the balloon barrage.
Bandits. German aircraft. (The term "Jerry," left over from the last war, is still widely used, particularly by the older officers.)
Bangers. Sausage barrage balloons.
Balbo. A large formation of enemy aircraft.
Beat it up. Dive bomber's attack on anti-aircraft. Have a wild time in town.
Billy can. Messtin in which aircraftsmen can cook food in an emergency.
Bind. An obstructionist. A thankless, uninteresting task. To obstruct.
Blood box. Ambulance.
Boobed it. Missed it, muddled it.
Blitz. A solid lump of. Large formation of enemy aircraft.
Blonde job. A young woman with blonde hair.
Black. A something badly done.
Blackout. Darkening cities against night air raids.
Breadbasket. Containing or holding incendiary or other small bombs dropped from raiding aircraft with release device to scatter them at predetermined altitude.
Briefing. Giving plan and details of a combat operation before flight.
Brock's benefit. Heavy anti-aircraft fire (after Brock's, the fireworks manufacturer).
Bucketing. Aircraft motions in bumpy air.
Bumph. Office correspondence, red tape, forms to be filled out.
Bumps and circuits. Circuits and landings.
Bogus. Sham, spurious.
Bomphlets. Propaganda leaflets dropped on enemy or occupied territory.
Bomphleteers. Airmen engaged in dropping pamphlets over enemy territory.
Browned off. Depressed, fed up, bored.
Brassed off. Bored with inactivity (diminutive of "browned off").
Brolly. A parachute.
Bus driver. A bomber pilot.
Bumming along. Flying casually or unconcernedly.
Cats eyes. Observers for night flights.
Chatterbox. A machine gun.
Cheesed. Depressed.
Close stick. Bombs dropped close together.
Completely cheesed. No hope at all.
Confetti. Ammunition for the machine guns.
Conservatory. Glass or plastic turret on aircraft.
Contour chasing. Low flying.
Cope. To accomplish. To deal with.
Crabbing. Damaged airplane limping home.
Crabbing along. Flying near the ground or water.
Deck. Crack down on the ground. To pancake an aircraft. Sometimes used as name for concrete base for a balloon platform.
Dirt. Much anti-aircraft fire or ack-ack.
Dogfight. An action in which opposing formations of aircraft break formation and engage in individual combats.
Drink, In the. To come down into the sea.
Dud. Bad weather, unfit for flying. Unexploded bomb.
Duffgen. Information of events that did not break as expected.
Dummy attacks. Practice attacks on a target without dropping bombs—sometimes over enemy objectives.
Dust bin. Retractable under-turret for air gunner.
Drogues. A sleeve towed on the end of a cable by an airplane to serve as a target for gunners in another airplane. A wind indicator, usually called a windsock.
Eggs. Bombs.
Erk. An aircraftsman novice, beginner in any job.
Evasive action. Maneuvering to escape direct anti-aircraft fire.
Eye-ties. Italians.
Fan. The propeller.
Flak. Anti-aircraft bursts in air (from the German, *Flieger Avwehr Kanonen*).
Flak ship. Auxiliary ship carrying anti-aircraft guns.
Flaming onions. Anti-aircraft fire shells.
Flap. Making a fuss, usually about something trivial. An air flight.
Flat out. Zealous and eager.
Flat spin, In a. Harassed.
Flare path. Lighted path for night take-offs.
Flip. A short trial flight.
Foxed. Stumped or fooled. Did something cunning.
French letter. Wind indicator.
Fusing switch. Control of fusing of bombs.
Gen. Slang for general information of any kind.
George. The automatic pilot.
Get cracking. Get going.
Goes to the movies. Go into action.
Gong. To collect. To get a medal.
Glass house. Power operated turret on aircraft.
Greenhouse. The cover, glass or plastic for a pilot's cockpit.
Gone for a Burton. Killed in action.
Gone crackers. Shell-shocked or flight-fatigued.
"Good Hunting." "Goodbye and good luck."
H. E.'s. Heavy explosives.
Ham fisted. Work of a clumsy pilot or mechanic.
Hared. Hurried.
Hay-wire. To become confused and incoherent.
Heavies. Big bombers.
Hip flask. A service revolver.

NO. 7

ALUMINUM, DEFENSE, AND YOU

ALCOA

THE TIMETABLE OF ALUMINUM FOR DEFENSE

up to September 10, 1941

1938

1938 Sept. *Munich.*

Oct. *Czechoslovakia invaded.*

Nov. Alcoa inaugurates $26,000,000 expansion program.

Dec. Alcoa produced 287 million pounds in 1938; had more than a year's supply on hand.

1939

1939 Jan. New extrusion and tube mill begins operation at Lafayette, Ind.

Feb. Start building an excess stock pile of airplane sheet.

Mar. *Bohemia and Moravia occupied.*

Apr. *Albania invaded; Congress authorizes Army to acquire 6,000 planes by July, '41, and Navy 3,000 by '44. Aluminum for all these would take about two months 1941 production.*

Sept. *Poland invaded; U. S. Neutrality proclaimed; limited National emergency proclaimed.*

Alcoa authorizes new metal-producing capacity at Alcoa, Tenn.

Nov. *Finland invaded; Cash-and-carry act signed.*

Alcoa completes $26,000,000 expansion program, begins plans for a larger one.

Dec. *U. S. protests blockade of German exports.*

New metal-producing plant authorized at Vancouver, Wash.

1939 production 327 million pounds; 215 million on hand.

1940

1940 Jan. *First request for defense appropriation in Budget Message.*

Alcoa announces $30,000,000 more plant expansion.

Mar. Alcoa reduces price of aluminum from 20c to 19c, starts construction of Vancouver, Wash., plant.

Apr. *Denmark and Norway invaded.*

May *Low countries invaded; National Defense Advisory Commission named.*

New metal-producing unit begins operation at Alcoa, Tenn.

June *Dunkerque; France capitulates.*

Additional metal-producing unit authorized at Alcoa, Tenn.

July *Congress lifts previous limits on numbers of planes.*

Aug. *Air offensive against England begins; 50 destroyers exchanged for island air bases.*

Alcoa reduces price of aluminum ingot from 19c to 18c; capacity for making alumina increased.

Sept. *Egypt invaded; Selective Service Bill passed.*

First metal manufactured at Vancouver, Wash., plant and new units for additional capacity authorized.

Oct. *Rumania invaded.*

Alcoa authorizes another $150,000,000 for expansion.

Nov. *26 bombers on contract turned over to Britain.*

Alcoa reduces ingot price from 18c to 17c; additional capacity authorized at Badin.

Dec. Alcoa 1940 production 413 million pounds; 154 million on hand.

1941

1941 Jan. *OPM established; NDAC says aluminum supply adequate to meet October, 1940, estimates of requirements.*

Alcoa authorizes additional capacity at Alcoa, Tenn.

Feb. *Aluminum put on priorities.*

Mar. *Lend-lease bill signed.*

Alcoa produces 44,000,000 pounds of metal this month.

Apr. *Yugoslavia invaded; U. S. occupies Greenland.*

May 150 million-pound-annual-capacity plant at Vancouver, Wash., completed and operating at capacity.

June *Crete lost; Russia invaded.*

July *New Government aluminum plants authorized; U. S. occupies Iceland; Japan moves into Indo-China.*

Alcoa produces 53,000,000 pounds this month; Badin unit authorized November, 1940 starts operation.

Aug. *U. S. Government announces Aluminum Company of America will build and operate 3 Government-owned aluminum smelting plants and one for making alumina.*

Alcoa announces ingot price reduction to 15c, effective October 1, 1941.

Alcoa and T. V. A. conclude agreement to unify two great hydro-electric power systems in the Tennessee Valley, which will add at least 200,000,000 pounds to America's annual aluminum producing capacity.

Alcoa produces 54,000,000 pounds of aluminum this month.

Sept. Sites selected for two of the Government-owned aluminum plants and for the alumina plant; railroad, water, and sewage facilities provided; construction contracts being executed.

Alcoa starts construction of 325,000,000 pounds per year additional alumina producing capacity at its own Mobile plant; construction started on additional capacity for 22 million pounds of aluminum fluoride, and 23 million pounds of cryolite annually at East St. Louis· eight new extrusion presses purchased to bring expansion up to 238% of pre-war capacity.

Excess stock pile of aluminum airplane sheet started in February, 1939, being maintained at 5,000,000 pounds.

ALUMINUM COMPANY OF AMERICA

Hoicked. Dodged.
Hun. Enemy airplane. A pupil pilot.
Hurryback. A Hurricane fighter airplane.
Inter com. Intercommunicating telephones on aircraft.
Incident. Bomb hit during an air raid.
Jim Crow. Dusk fighter patrol. Roof watcher for enemy aircraft.
Jinking. Maneuvering to dodge enemy fire.
Jinkaway. Sharp maneuver. Sudden evasive action of aircraft.
Jump out the window. Bail out.
Kipper patrol. Coastal Command aircraft which convoy fishing fleets.
Kites. Airplanes (a mechanic's term).
Laid on. Things legally supplied. Something arranged.
"Late Arrivals" Club. Fliers shot down in action but who eluded enemy and reached home safely.
L.A.C. Leading aircraftsman.
Made. Obtained by illegal means. (See "won.")
Mae West. A breast life preserver. Inflatable waistcoat.
Master switch. Control of bomb release.
Mein Kampf. Leaflets to be dropped in enemy territory.
Met. Meteorology.
Met blokes. Meteorologists.
Mouse traps. Submarines.
Mickey Mouse. Automatic lever releasing bombs on aircraft as a stick at predetermined intervals.
Mud. Flak spraying on the plane.
Muscle in. To take advantage of a good thing.
Near miss. A bomb or bombs dropped very near a target.
Nobes. Nobody's business.
Nickels. Secret word for bundles of leaflets to be dropped.
Nit. Pupil pilot.
Office. Pilot's cockpit.
Onions. Anti-aircraft explosives.
Ops. Operations.
"Over" signal. Over-airdrome signal.
Organized. Lifted, or stolen.
Packed up. Out of commission, stopped.
Pattern bombing. Bombs released simultaneously by a flight of aircraft in formation.
Peddling home furiously. Flying home with nose well down.
Peel off. Curve away from squadron formation.
Perspex. Windscreen.
Pinpoint. Any predetermined place on flight.
Pick up. Wrecks of enemy aircraft found after original total was estimated.
Picking a pinpoint. Locating a place on the ground.
Play pussy. Hide in the clouds.
Pleep. A squeak with a high note.
Plug away. To keep firing. After an enemy.
Plumbing. Oil and fuel lines.
Pom-pom. Small anti-aircraft guns.
Poor view, To take a. To disapprove of something.
Probables. Enemy aircraft shot down but unconfirmed officially.
Pukka gen. Exclusive or accurate information.
Put up a black. Poor attempt.
Pulpit. The transparent cockpit or rotatable tail turret on a bomber.
Quick squirt. Short burst of machine gun fire.
Quickie. Same as above.
Real gen. Inside information.
Rang the bell. Successful action.
Right drill. Done correctly.
Rings. Designations of rank on an officer's cuffs.
Roller skate. A tank.
Ropey. Unsettled weather outlooks. Worn-out (as equipment in poor condition). Used generally to indicate unsatisfactory actions or things.
Rumble in to. To make a power landing.
Runs out of altitude. Crashes.
Run. A flight to a mission or over a target.
Salvo. A number of bombs dropped at the same time.
San fairy Anne. Ça ne fait rien. It doesn't matter.
Scrapwing. Auxiliary low wing loading wing to assist take-off of fighters and released when altitude is gained.
Sitzkreig. Inaction, opposite of Blitzkreig.
Slipwing. Type of airplane with low wing-loading to assist take-off of smaller fighters attached below.
Stick. Bombs released in series at predetermined regular intervals.
Scramble. Take-off.
Scrambled eggs. The gold oak leaves on an air marshal's hat.
Shoot a line. Exaggerate.
Shot down in flames. Reprimanded by superior officer. Crossed in love.
Show. Any effort or job.
Sleeves. Covering for wings when left in open.
Spit. Spitfire fighters.
Spotter. Roof watchers for enemy aircraft. Sometimes called Jim Crows.
Snake about. Aerobatics.
Spun in. A bad mistake, adopted from an airplane crash resulting from a tail spin.
Squirt. Machine gun burst.
Station Master. Commanding Officer of an R.A.F. main aerodrome.
Stooge. Any assistant, a second pilot.
Stooging about. Patrolling, flying slowly. Waiting to land.
Strip. Reprimand by superior officer ("tore a strip off").
Synthetic. Concocted. Ground Training.
Tally-ho. We are in contact with the enemy.
Tail-end Charlie. The rear gunner. Also the rear airplane in a formation.
Tarmac. Hard take-off runways or aprons.
Tee up. Preparation for any job.
Ten-tenths. Unbroken cloud or fog.
Tight pattern. Bombs dropped to hit close together.
Tanker aircraft. An airplane used for refueling another airplane in flight.
Taped. Solved. ("Got it taped"—understood it.)
Times off. Times of taking off.
Tin trousers. Officer promoted to air rank (from wide gold stripe on trousers of dress uniform).
Touch bottom. Crash.
Toys. Certain training equipment.
Trail angle. Angle of lag subtended at the airplane by the point of impact of the bomb and the position on the ground vertically under the aircraft at the moment of impact.
Type. Classification of people (used with either favorable or uncomplimentary adjectives).
"U." Code: "You are running into danger."
Up sun. Between sun and enemy aircraft.
Vapor trail. White smoke made by frozen exhaust at high altitude.
View, Take a. Used by R.A.F. with an adjective to express an opinion on anything.
Vicks. V-formations.
Waffle. Circumlocution.
Waiting Winnie. Air raid siren.
White horses. White caps on the sea or other water.
Wizard. Good or beautiful. Really first class. Attractive.
Won. Obtained by unorthodox methods. Polite word for "stolen" when theft is regarded as justifiable.
Wuffs. Gun noises.

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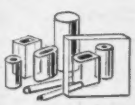
CAST RESINS		**BAKELITE** transparent, translucent, and opaque cast resins supplied in sheets, tubes, rods, and special castings that can be machined, sawed, drilled, engraved, and polished with standard tools.
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1941

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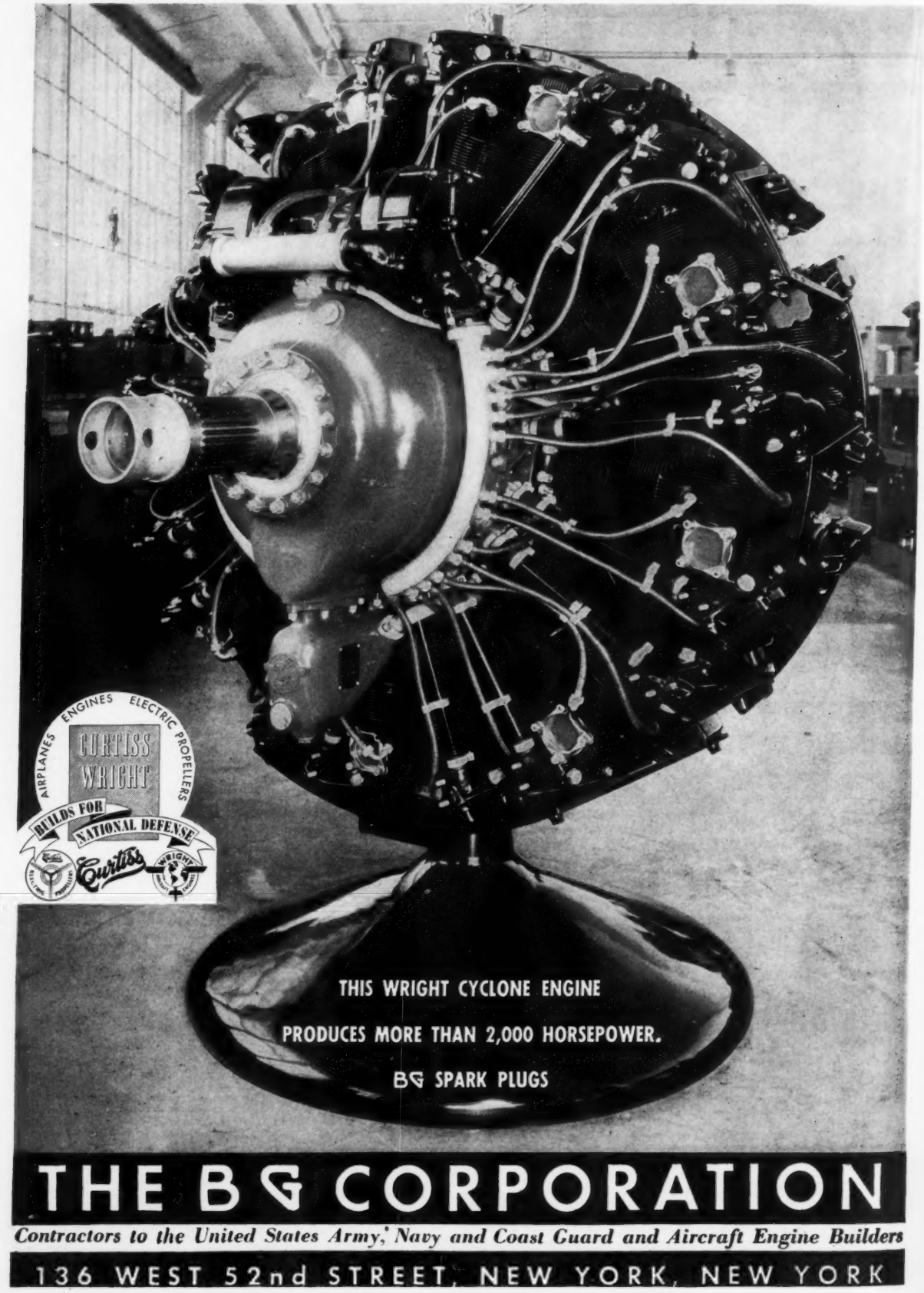
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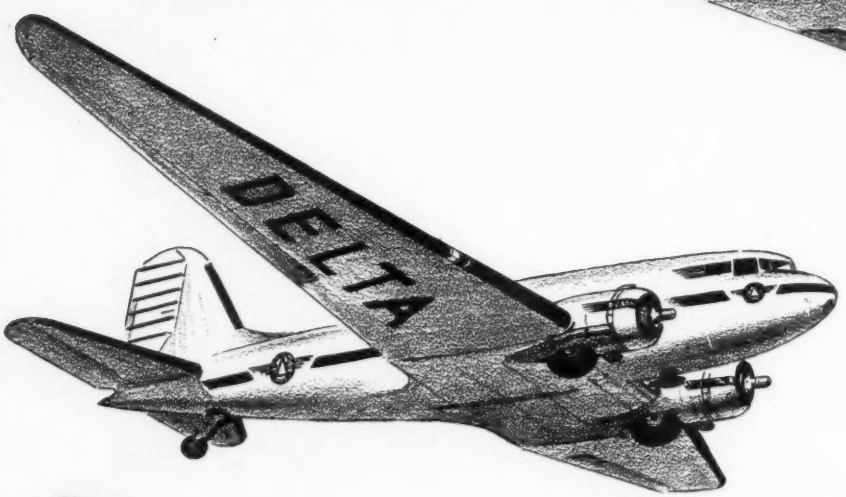

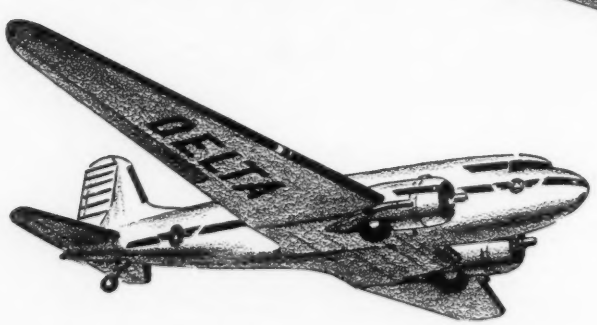

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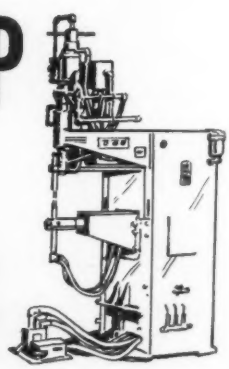

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TUBING (RIGID NON-FERROUS)

Aluminum Company of America

TUBING (RUBBER)

Firestone Aviation Products Company
General Tire & Rubber Company
The B. F. Goodrich Company

TUBING (STAINLESS STEEL)

Summerill Tubing Company

TUBING (STREAMLINE)

Summerill Tubing Company

VACUUM SYSTEMS

Simmonds Aerocessories, Inc.

VALVES & ACCESSORIES

Cleveland Pneumatic Tool Company
Eaton Manufacturing Company
Eclipse Aviation Division, Bendix Aviation Corporation
Fleetwings, Inc.
Pump Engineering Service Corporation
Simmonds Aerocessories, Inc.
Thompson Products, Inc.
Westinghouse Electric and Manufacturing Company

WHEELS & BRAKES

Bendix Products Division, Bendix Aviation Corporation
General Tire & Rubber Company
The B. F. Goodrich Company
Goodyear Tire & Rubber Company
Simmonds Aerocessories, Inc.
Warner Aircraft Corporation

WIRE ROPE & CABLE

John A. Roebling's Sons Company

House Organs and Catalogues

(*Continued from page 32*)

B-19 Test Flight

The Guardian of a Hemisphere Takes to the Air. An account of the first flight of the Douglas B-19 from Clover Field, Santa Monica, to March Field, Riverside, California. The article describes the events that took place during the initial hop and the reaction of the plant personnel who were permitted to leave their work to watch the 212-foot bomber's take off. *Douglas Airview*, July.

Sub-Stratosphere Bombing

R.A.F. Calling. Report on a special broadcast made from England by short wave to the workers of the Boeing plant in Seattle, giving an account of the first major raid on the German military machine in which the Boeing B-17 Flying Fortress was used. The commentator was a 21-year-old Scotch flight lieutenant who piloted one of the formation four-gined bombers over Brest to bomb the German battleship, *Gneisenau*.

The raid was conducted at unprecedented height at a temperature of −75°F. By using the Sperry automatic bombsight a large number of hits were scored. The broadcast was chiefly confined to the pilot's personal observations and reactions to the flight, the airplane and the particular technique of high-altitude bombing. *Boeing News*, August.

Wind Tunnel Description

Northrop Wind Tunnel Speeds Model Testing. This article in a house publication of The Fafnir Bearing Company describes the wind tunnel recently built by Northrop Aircraft, Inc., at its Hawthorne plant. The construction and operation of the tunnel are outlined giving particular attention to the power plant and vibration-proof transmission shaft in which Fafnir bearings were used. *The Dragon*, August.

Sea Patrol

With a "Sunderland" on Patrol. A study in pictures of the work performed by the Sunderland flying boats of the R.A.F. Coastal Command. Close-ups of the mobile bomb racks, gunners' positions and various fighting stations are shown. *Neptune*, April.

Lightplane Spark Plug

Blue-Crown Aviation Spark Plugs. A technical leaflet on the characteristics of a new ceramic-insulated spark plug designed especially for light airplane engines. The new plug known as the Blue Crown uses a bridge-type flat ground-wire made of catalyzed nickel-manganese steel electrically welded to both ends of the shell. The bridge is offset from the center for easy cleaning and adjustment. The insulator is made of Poranite to assure lasting resistance to high heat. *Motor Master Products Corporation*, Chicago.

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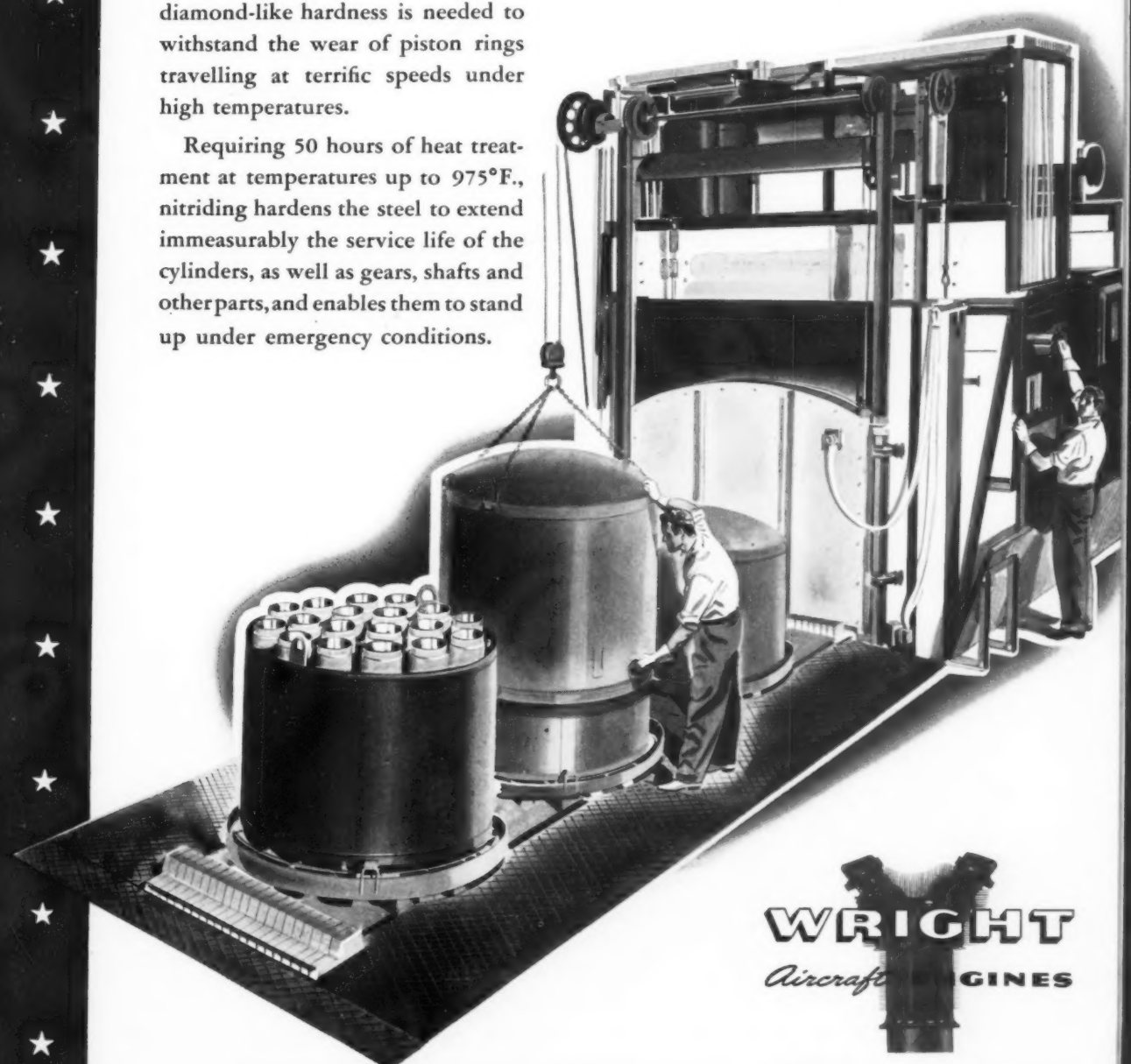

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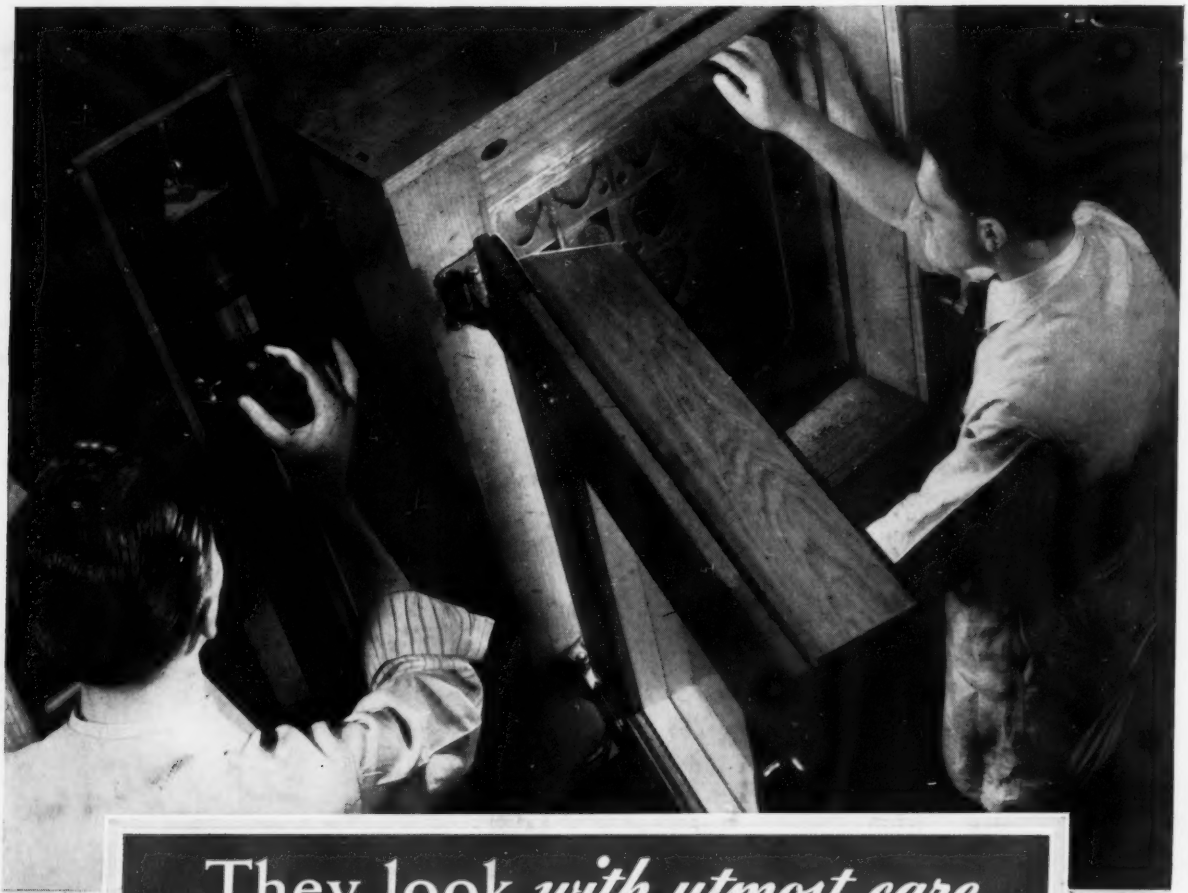

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